ATSimulations - Sibwings Antonov An-2
User guide
Version 1.5

INDEX

INTRODUCTION

Welcome to the Antonov An-2 User Guide! SibWings in cooperation with ATSimulations are happy to present the updated version of Sibwings Antonov An-2!

The An-2 is a very special bird. It was designed to meet Soviet Ministry of Forestry requirement for a utility aircraft and became one of the most famous aircraft in history. Thanks to its outstanding flight characteristics it was used in more than forty spheres with numerous modifications developed. During its record-setting 45-year production more than 18 000 airplanes were built, dozens of nations and airlines have employed them in civil and military roles. The An-2 gained huge popularity all over the world and nowadays continues flying low and slow ☺

In this package we offer you several different modifications of An-2 wheels, skies and float. This models faithfully reproduces all the particular, real-life, Antonov An-2 features in a meticulous way. We're sure you will enjoy the exquisite rendition of the exterior and interior models, highly-detailed 3D-panel and HD textures, fully-animated dynamic VC, accurate flight dynamics, authentic sounds, and so much more which will make your An-2 flying experience very realistic! We have spent lots of time developing all of these features with the invaluable contribution of the real An-2 pilots. So, we guarantee you will enjoy flying our Antonov An-2!

Before jumping into the cockpit and taking off at full power, we recommend you to invest some time into getting acquainted with this User Guide. Even if you are an experienced real-life pilot, or an FSX/P3D advanced user, you need to 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 Antonov An-2, the most interesting moments of the airplane's history, specifications and characteristics, flight configurations, and pre- and post-flight checklists, as well as performance guide.

Have fun!

ATSimulations & Sibwings

CREDITS

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Special thanks to **Jan Spycher** for the access to the real airplane.

Special thanks to **Ilya Prokhorenko** (Lead Engineer of Flight Simulation Training Devices Department of St. Petersburg State University of Civil Aviation) for consultations about airplane equipment and systems.

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SYSTEM REQUIREMENTS

- Windows XP SP3/Vista/7/8/10
- Microsoft Flight Simulator Steam or X (SP2 with Acceleration pack) or Prepar3D
- 4096 MB Ram
- Processor: 3 GHz
- Available hard drive space: 1000 MB
- Video card: 512 MB DirectX 10 compatible
- Other: mouse, joystick, sound card, speakers/headphones, TrackIR

WHAT'S NEW IN VERSION 1.5

- Lockheed Martin Prepar3D compatible (tested in v3.4, v4.4, v4.5)
- Plus to regular wheels version four new models (two skies, float and 12 seats)
- Load manager
- Freezing windows feature
- A2A in cockpit rain effect (for Prepar3D v4)
- A lot of fixes and improvements

FEATURES

3D Models

- Accurate exterior and interior models of wheeled, skies and float modification*
- HD textures with specular, bump and reflection maps
- FPS friendly

Panel & Gauges

- All gauges are developed with 3D parts
- Separately animated realistic needles shadows
- Most knobs have moving along shadows
- Panel surface contains bump-map
- Gauge glass has reflection and fingertips visible at a specific sun angle
- Realistic night light

Systems

- Fully simulated electric system
- Partly simulated pneumatic system
- Realistic engine starting system
- Simulated engine overheat and engine fire, anti-fire system

- Simulated windows freezing and windows heat system
- Load manager, Aircraft manager

Flight dynamics

- Accurate flight dynamics developed in close cooperation with the real An-2 pilots

Sounds

- Engine sounds recorded from the real aircraft
- All switches, knobs and levers are sounded

FSX/P3D SETTINGS

We recommend the following FSX settings for the Antonov An-2 add-on:

Remember to set all the REALISM sliders to their maximum in order to fly the aircraft as it is intended.
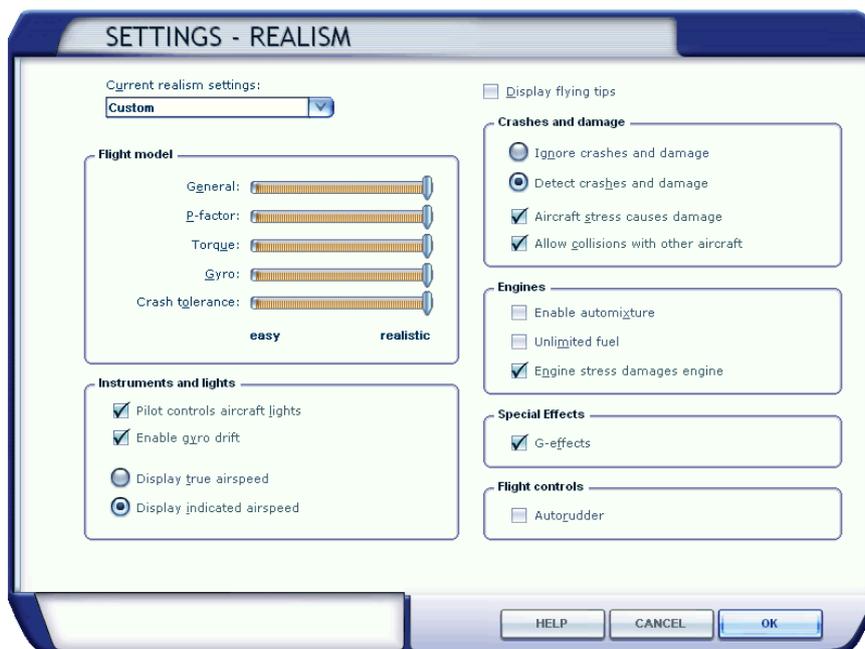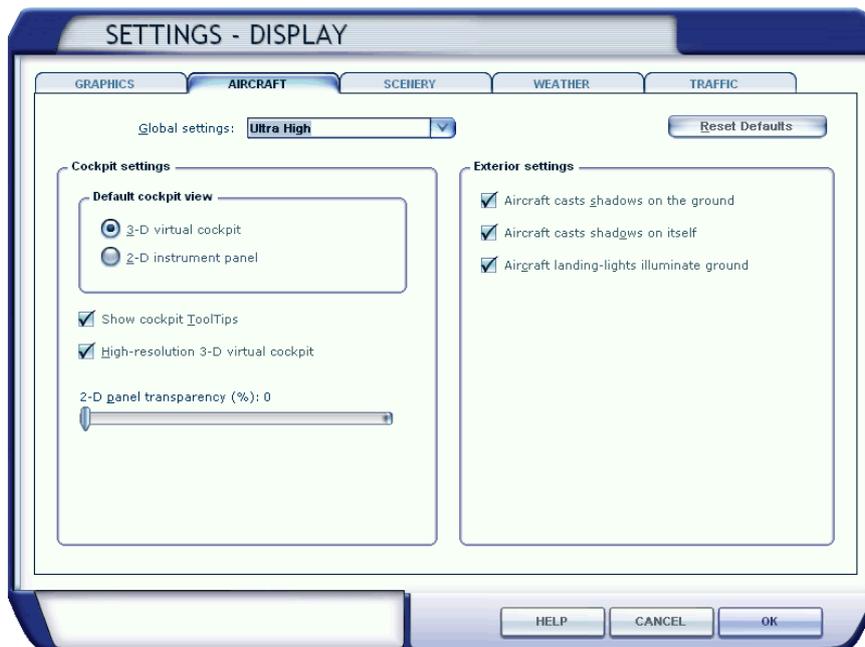
If you are not familiar with any of these settings, please, consult your FSX/P3D documentation.

We also recommend to use DirectX 10 preview mode. The Antonov An-2 supports interior dynamic shadows.
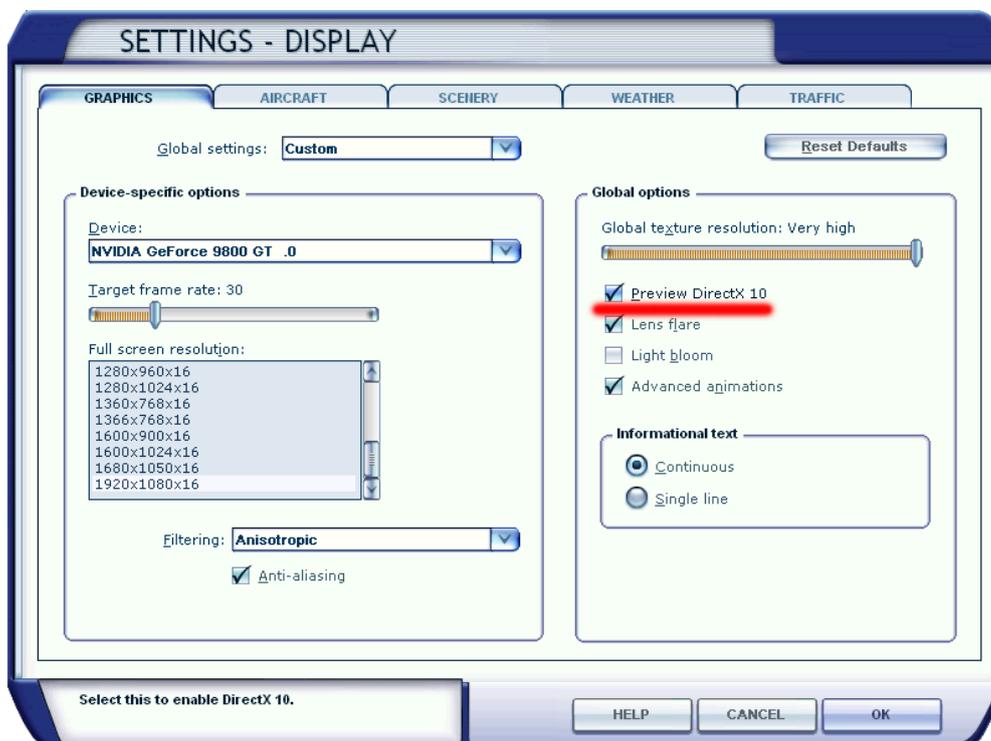
HISTORY OF THE ANTONOV AN-2

The Antonov An-2 (Russian nickname "kukuruznik" or "Annushka", NATO reporting name "Colt") is a single-engine multipurpose biplane. Designed as a utility aircraft for use in forestry and agriculture the An-2 became one of the most famous aircraft in history and the world record-holder on duration of its 45-year production run. So, let's see how the great history began.

The An-2: history beginning

In 1943 Oleg Antonov worked as Yakovlev's First Deputy in his design bureau. Alexander Yakovlev in those years was Deputy Commissar of the aviation industry and spent a lot of time in government. He visited design office every day looking at the drawings, making comments, but virtually all of the work on the Yak-3 creation and Yak-9 improvement was done under the direct supervision of Antonov. Due to heavy workload Antonov couldn't continue his studies for a multi-purpose aircraft that he had begun even before the war. But he didn't give up that idea and got back to it in the beginning of 1945 when it became clear that war was coming to an end and soon the country would need civilian airplanes again.

The most important thing in the new machine he thought should be a high-lift wing. First time he saw such a wing on German Fi 156 "Storch" and he was fascinated. Truly he began to compose the An-2 under the influence of that machine. In the design bureau Antonov was busy with fighters, so he was designing future An-2 at home. When he showed his drawings to Yakovlev and proposed to design this aircraft under Yak brand, Yakovlev refused saying that such a plane was not his specialization. At that time Antonov decided to create that plane one day himself.

Oleg Antonov, the An-2 chief designer

Right after the victory in August 1945, Yakovlev let Antonov leave the bureau and move to Novosibirsk in order to create his own design bureau and start creating his own airplane. Most of the Novosibirsk branch employees were coming back to Moscow and Antonov took the lead of the small group left.

In Novosibirsk, Oleg Antonov has developed An-2's detailed design, wrote an explanatory note, made a summary of the weight and went to Moscow to show it all to Yakovlev. Without his approval no one would even consider the project. Luckily Yakovlev

wrote his famous note: "This is an interesting plane, you need to build it." Since that Antonov has never ever come close to any of Yakovlev's airplanes, he soaked himself in work on the An-2.

He started with the recruitment of staff. Some of the factory engineers were eager to join new team, but they were not allowed. So Antonov went to the factory college and invited 25 graduates to join his design bureau, which consisted of young professionals. Such a "weak" team could do the job only thanks to its leader and his working style. He was able to inspire people with new ideas and evoke creativity, so people were working very diligently. The atmosphere in bureau contributed to the fact that the An-2 drawings were made very quickly.

On August 31, 1946 a test pilot Volodin committed the first flight on the An-2 which lasted 15 min. When he landed he smiled: "Everything is good, just need to lift the seat." Thanks to its outstanding flight characteristics tests of the An-2 were successful and required no special adaptations, just minor ones like lifting the seat.

The AN-2 first took-off from Yeltsovka airdrome, Novosibirsk

The Antonov An-2 was designed to meet Soviet Ministry of Forestry requirement for a replacement of the Polikarpov Po-2, which was used in large numbers in both agricultural and utility roles. Antonov designed a large single bay biplane of all-metal construction, with an enclosed cockpit and a cabin with room for seats accommodating twelve passengers. The first prototype, designated SKh-1, was powered by a Shvetsov ASh-21 radial engine. The second prototype was fitted with a more powerful Shvetsov ASh-62 engine, which allowed the aircraft's payload to be significantly increased from 1,300 kg (2,870 lb) to 2,140 kg (4,720 lb), and in this form it was ordered into production.

Serial An-2 production was decided to start in Kiev, Ukraine. However, the most severe test of the An-2 was waiting ahead. In late 1952, the government issued a decree

Ukrainian Hryvna depicting the An-2 airplane

on the termination of the An-2 production in order to produce fuselage compartments for IL-28. All the An-2 tooling was thrown out on the street and shop cleaned. Antonov realized that if serial production is stopped then it would be the end of the An-2. But nothing could be done as the decree was signed by Stalin. For the long six months the fate of the An-2 had been hanging on the hook. Then Stalin died, and soon the An-2 production was restarted in Kiev, where the bulk of 5,000 units had been produced by 1960. Later Soviet production was continued in Dolgoprudniy, Russian SFSR.

After 1960, however, most An-2s have been built at Poland's WSK factory in Mielec, with over 13,000 made there before full production ended in 1991. Limited production from parts stocks, as well as spares and maintenance coverage continued until 2001, when four aircraft were produced for Vietnam. China also builds the An-2 under license as the Shijiazhuang Y-5. It has been occasionally and erroneously reported that there was East German production of the An-2. While An-2s were extensively refurbished in East Germany, there were no new aircraft built there. All in all more than 18.000 units of the AN-2 and its modifications were produced in three countries – USSR, Poland and China.

Operation

Operation of the AN-2 started rapidly, in several spheres of national economy of the USSR. The most mass use the aircraft found performing aviation chemical works in agriculture and forestry. They included extranutrition by applying mineral fertilizers, struggle with plant pests by dispersion and spraying of pesticides, service of livestock sector by sowing forage herbs, extranutrition of pastures, extermination of carnivorous animals. The AN-2 used for

An-2 on skis at Volosovo air field, Moscow region

sowing crops, defoliation cotton and to dessication of sun-flowers and paddy. Many machines of the zero and first series were passed to the Ministry of geology for servicing expeditions performed geological and prospecting works.

Range of use of the AN-2 widened every year. In Nenets national district when helping hunters it explored areas of animal and birds habitation. The AN-2 performed aerial photography to define speeds and directions of rivers flow; transported people, animals, mail, different cargoes; did aviation monitoring including flying around gas and oil pipelines, electricity networks as well as participated in liquidation of anthropogenic

catastrophes. The AN-2s were used very intensively when building of Baikal-Amur trunk road.

Twenty six countries have bought them for their air forces and civil organizations. Due to its outstanding parameters the aircraft was used in more than 40 spheres and as its basic airframe is highly adaptable numerous variants have been developed. These include hopper-equipped versions for crop-dusting, scientific versions for atmospheric sampling, water-bombers for fighting forest-fires, flying ambulances, float-equipped seaplane versions, and lightly armed combat versions for dropping paratroops. The most common version is the An-2T 12-seater passenger aircraft which is very popular among civilian parachute clubs.

Antonov said that the main thing is to allow the aircraft to show itself. He said: "If they make at least 50 pieces of the An-2 then a bright future will be ensured for it," and so it happened. The An-2 became one of the most popular aircraft in the world.

Why it became so popular? What made it so special?

When Oleg Antonov was asked "Why had the An-2 got such a wide use?" he answered: "I think it is due to its flight parameters first of all: short take-off and landing distances, simplicity of piloting and operation. This machine is undemanding to the airfields".

Use of the simple and reliable construction with powerful mechanization which includes automatic leading-edge slats and flaperons, provides aircraft stability on big angles of attack and full impossibility to bring to stalling with extended flaps. Even with abandoned control the aircraft recovered from the spiral to the horizontal flight regime.

A note from the pilot's handbook reads: "If the engine quits in instrument conditions or at night, the pilot should pull the control column full aft and keep the wings level. The leading-edge slats will snap out at about 64 km/h (40 mph), and when the airplane slows to a forward speed of about 40 km/h (25 mph), the airplane will sink at about a parachute descent rate until the aircraft hits the ground."

The An-2 indeed has no stall speed quoted in the operating handbook. Pilots of the An-2 say one can fly the aircraft in full control at 30 mph. This slow stall speed makes it possible for the aircraft to fly backwards. (This is also possible with almost any other true Short Take Off and Landing (STOL) aircraft, but the Antonov has the distinction of being able to do the trick in the mildest headwind.)

Combat service

Even such a peaceful biplane as the An-2 has its own combat history. Unfortunately, most of the An-2s that had to participate in combat, were completely unadapted for this purpose planes.

A prototype of the An-2 combat modification which was successfully tested but has never launched in serial production

The first authentically known combat use of the An-2 occurred in Hungary in 1956. During the suppression of the rebellion Ana "Colts" were used to drop leaflets over the troops of Imre Nagy, as well as for reconnaissance observation.

Also An-2s were used in the war in Indochina. DRV (Democratic Republic of Vietnam) Air Force An-2 did first combat flight to Laos, where in 1960-62 a civil war went on. Vietnamese "Colts" brought equipment, ammunition and weapons to its allies. Around the same time, the An-2s were used for the supply of Vietcong.

In the Vietnam War the An-2 was used as a naval interceptor and had been modified to carry two torpedoes under the wing. The planes low speed did make it tricky for fast jets to intercept it as it could fly slower than the jets landing speed. At those slow speeds it could ground hug under radar to help it evade detection. The chief advantage for the An-2 was that they could take off and land in small or improvised airstrips. Vietnamese used these aircraft for operations against ground targets, but they often came under enemy fire.

In Cambodia in 1970, the An-2s have been used by government forces in the battles with the guerrillas as a transport aircraft. In 1979, again in Cambodia, the An-2s were involved in the fight, this time with the units of the "Khmer Rouge". In addition to transportation, they were used as an advanced forward air. When finding targets crews

bombed them and dropped hand grenades with white phosphorus which served as a reference point for attack aircraft.

During the Croatian War of Independence in 1991, a few old Antonov An-2 biplanes used for crop-spraying were converted by the Croatian Air Force to drop makeshift bombs and were used in supply missions to the town of Vukovar and other besieged parts of Croatia. They were also used to drop supplies by parachute on isolated garrisons.

The An-2 today

Since the collapse of the Soviet Union and the Eastern European communist states, most airlines in these areas have been withdrawing their An-2s from service, as some of these aircraft are now over 40 years old and the production of avgas had decreased. Private operators are still using the planes, as their stability, capacity and slow-flying ability make them very popular, for instance in skydiving.

Whilst their high noise levels, increasing maintenance costs, high fuel consumption and unsophisticated nature (the pre-flight checks alone take between 30 and 40 minutes) make them obsolete for commercial service in Europe, the huge number of aircraft available means that prices are low (from as little as $30,000 for a serviceable example). This makes them ideal for the developing world, where their ability to carry large loads into short airstrips makes them assets to airlines on a budget. Many ex-Aeroflot An-2s work as regional airliners in Africa, Central and South America, Cuba and south-east Asia.

North Korea has a number of the aircraft with wooden propellers and canvas wings on their variants (the Y-5 version license-built in China) giving them a low radar cross-section, and therefore a limited degree of "stealth". In a war they could possibly be used to parachute or deliver special forces troops behind enemy lines for sabotage operations.

The An-2's ability, looks and flying characteristics, and its status as one of the world's biggest single-engine biplanes, mean that demand for the An-2 is increasing in the United States and Western Europe, where they are prized by collectors of classic aircraft, making it an increasingly common sight at airshows. However, nearly all western nations (the USA, Canada, the United Kingdom, France, etc.) prohibit the use of the An-2 commercially, despite its obvious potential as a bush plane and parachute aircraft. This is because the aircraft has not been certified by the relevant national aviation authorities, which limits its use.

The AN-2 is still recognized as an outstanding in its class machine and has many sincere admirers on all continents. On the information on 2007 more than 4.000 of the AN-2s are successfully operated. Many of them fly for more than 40 years and are in a perfect flying condition.

In 2012, the Ministry of Transport of the Russian Federation announced the development of the An-2 deep modernization program including the replacement of engines and aeronautical equipment. Start of the program is scheduled for 2015. So, there is a good chance for the An-2 to start a new era in its history!

If you would like to know some more interesting facts about the An-2 we recommend you to read these articles:

http://www.seqair.com/Other/UnFalco/UnFalco.html

http://www.an2plane.ru/en/event.htm

GENERAL DESCRIPTION

Antonov An-2 CCCP-55721

This aircraft was used by "Aeroflot" in northern territories. In 1990 it was sold to some European enthusiasts. It arrived by rail to Denmark and was assembled by Russian mechanics. Due to paperwork problems it has never been allowed to fly in Denmark. The airplane had been kept for several years in Thisted, before the owner donated it to Dansk Veteranflysamling. Later it was sold to a group of Germans who collected only the wings.

Unfortunately today the fuselage with registration CCCP-55721 looks like this...

Antonov An-2 PAF-0856

Serial no. 1G 108-56 tactical no. 0856 is from 41 Pulk Lotnictwa Mysliwskiego (41 Fighter Air Regiment) in Malbork. Standard camouflage except for Russian Blue being used instead of Light Olive Green. Regiment badge is under cockpit on both sides.

Antonov An-2 LY-KAF

"Blue Tiger" is a private aircraft from Sweden. Aircraft was repaired and repainted at the aviation plant at Kaunas, Lithuania in 2000. It has a twin-brother LY-KAE. Unfortunately we can't read what is written on the fuselage sides, so if you can please help us.

Antonov An-2 PAF-4774

Legendary "Wiedeńczyk" on which three pilots and their families escaped from Krakow to Vienna on April 1, 1982. The aircraft was returned and served at Poland Air Force. In 2008 it was repainted from camouflage.

Antonov An-2 D-FONL

In soviet time this airplane was used by Lufthansa in East Germany. Nowadays the registration is changed to D-FONL, but historic DM-SKL registration is still seen on fuselage sides.

A couple of historic photos of Lufthansa's An-2 in East Germany.

Antonov An-2 HA-ABA

A privately-owned Antonov An-2 from Switzerland.

Antonov An-2 SP-ASR

A privately-owned Antonov An-2 from Switzerland.

Antonov An-2 Croatian Air Force

Took place in night bombing operations nearby Vukovar in December 1991

Antonov An-2 Skies H-542 "Polar aviation"

Aircraft of soviet arctic pioneers.

Осмотрев самолеты, пингвины отправились домой

Antonov An-2 Skies RA-01146

Aircraft of modern Antarctic scientists. Unfortunately destroyed by strong wind in December 2006.

An-4/An-2W Floats

17 Yellow. One of the first An-4 (An-2 on floats) Took place in test flights in 1951. No actual photos could be found.

SPECIFICATIONS

The Antonov An-2

The An-2 is a single-engine biplane utility/agricultural aircraft designed in the USSR in 1946. Wings are of an unequal span single bay biplane design, all metal construction, with fabric covering. Fuselage is of all-metal stressed skin semi-monocoque construction. Tail is a braced all metal structure with fabric covering. Wing area is 770 square feet total.

Note: wings have full length leading edge slats and ailerons droop with flap actuation to provide great STOL performance.

Dimensions
Length	12, 7 m (40 ft 8 in)
Height	5, 35 m (13 ft 2 in)
Wing span	18, 2 m (59 ft 8 in)
Wing area	71, 52 m (769.8 sq ft)

Engine
Shvetsov ASh-62 nine cylinder radial engine (which was a development of the Wright R-1820 Cyclone) 1000 hp, displacement 30 liters.

Fuel
Total tank capacity: 317 US galls (1200 litters)

Air speeds
Max speed	258 km/h (160 mph)
Cruising speed	190 km/h (120 mph)

Stall speed   50 km/h (30 mph)

Performance
Range   845 km (525 miles)
Service ceiling   4500 m (14,750 ft)
Rate of climb   3, 5 m/sec (700 ft/min)
Take-off distance   170-490 m (560-1600 ft)
Landing distance   425 m (1400 ft)

Weight
Empty weight   3300 kg (7300 lbs)
Max take-off   5500 kg (12000 lbs)

12 735

5 350

18 176

3 360
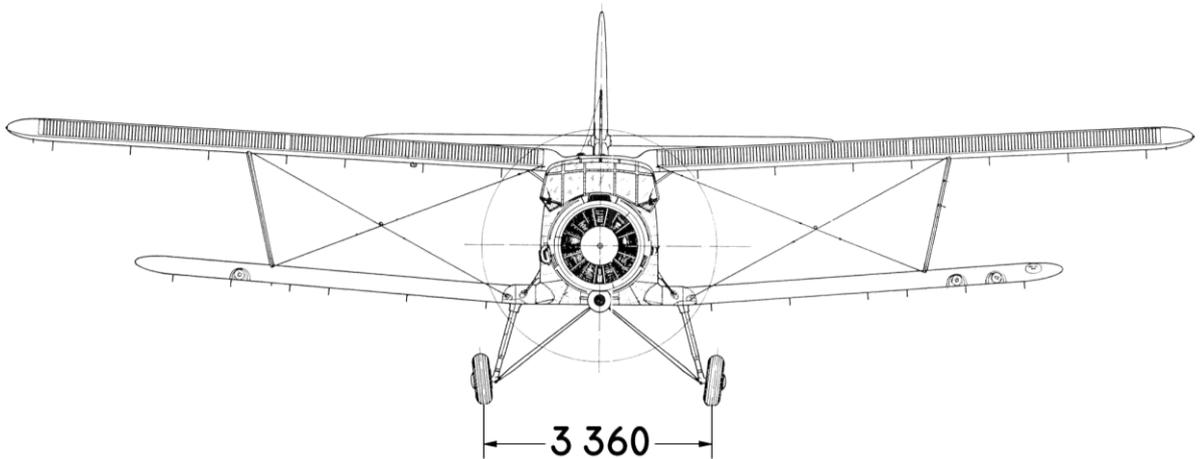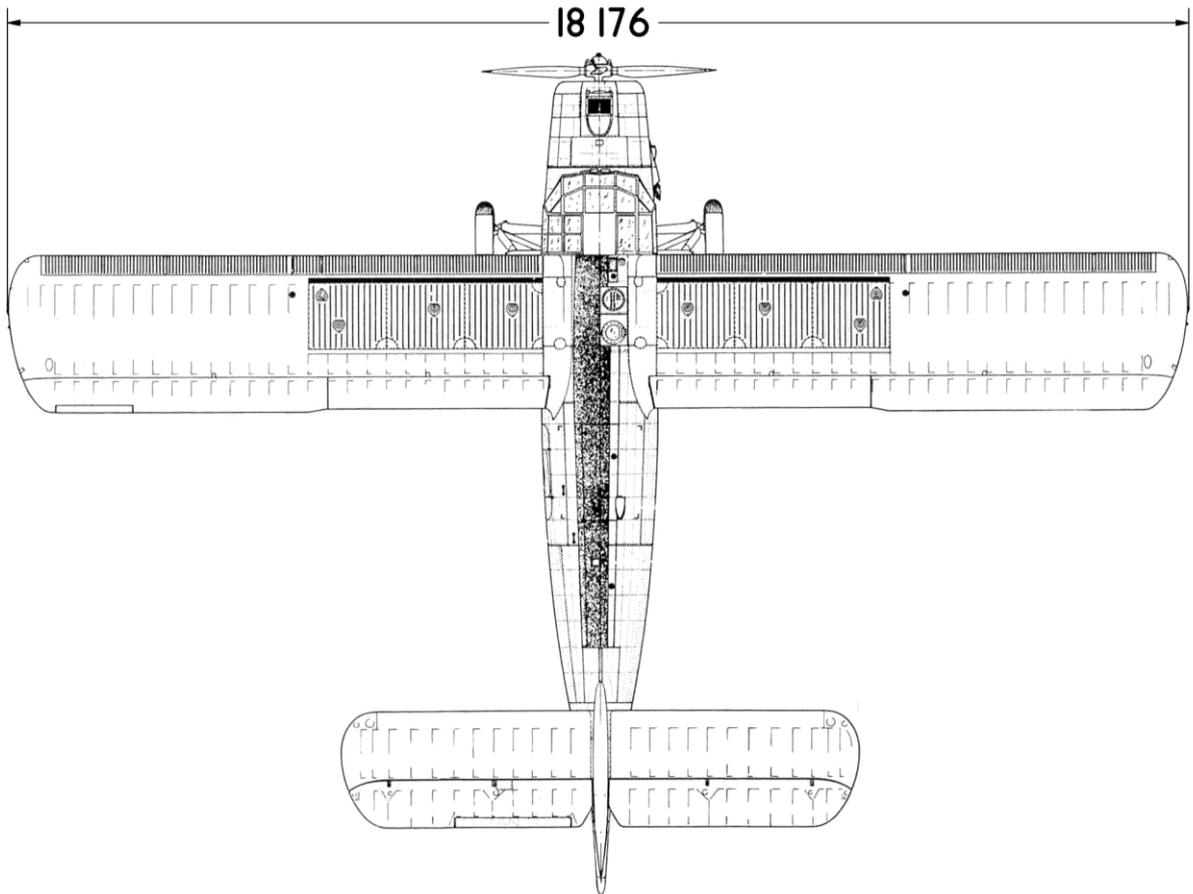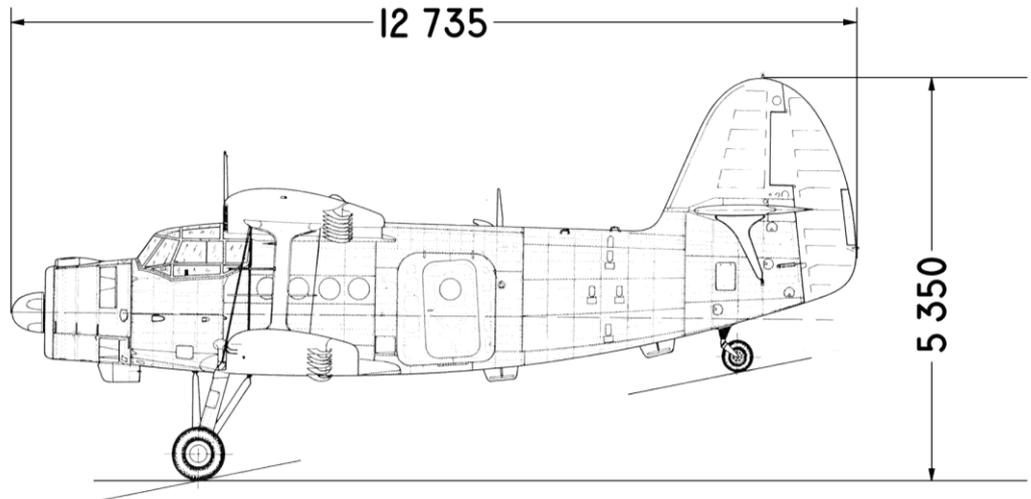
PANELS AND CONTROLS
MAIN PANEL
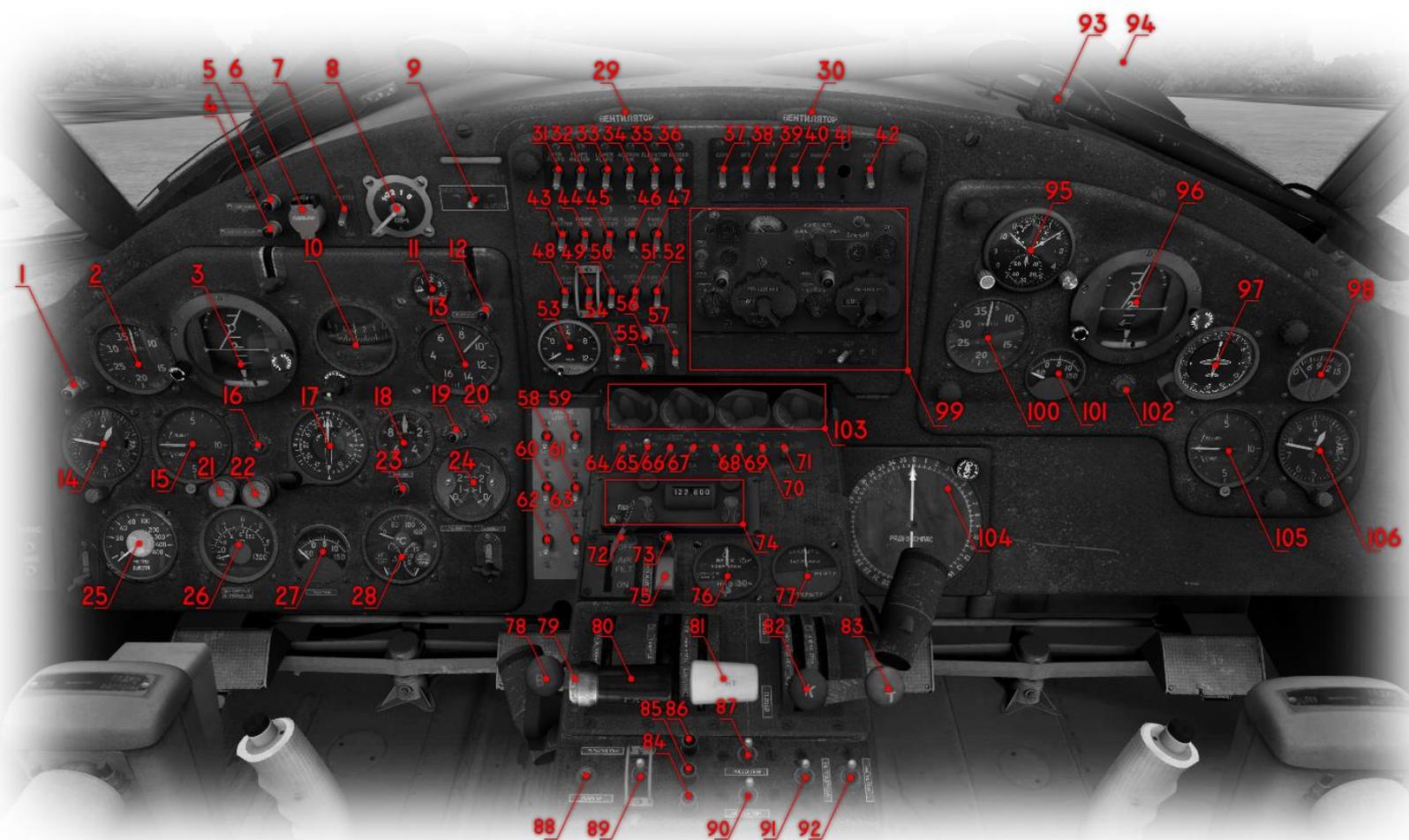
1. Radioaltimeter signal lamp
2. Airspeed indicator
3. Attitude indicator
4. Antifire system ready lamp
5. "Fire" signal lamp
6. Fire extinguisher button
7. Starter circuit breaker
8. Magnetos knob
9. Starter switch (Left click activates electric motor to rotate flywheel. Right click - clutch flywheel to engine)
10. Directional gyro
11. Ampermeter
12. Generator lamp
13. Manifold pressure indicator
14. Altitude indicator
15. Vertical speed indicator
16. "Fast slave" button
17. UGR compass
18. RPM indicator
19. Chip detector signal lamp
20. Oil dilution signal lamp
21. Left tank low fuel signal lamp
22. Right tank low fuel signal lamp
23. Marker signal lamp
24. Cylinders heads temperature indicator
25. Radioaltimeter indicator
26. Fuelmeter indicator
27. Carburetor temperature indicator
28. Engine gauge (Fuel pressure, oil pressure and oil temperature indicators)
29. Cabin fresh air panel lever (Left)
30. Cabin fresh air panel lever (Right)
31. Up wing flaps circuit breaker
32. Flaps master circuit breaker
33. Low wing flaps circuit breaker
34. Aileron trimmer circuit breaker
35. Elevator trimmer circuit breaker
36. Rudder trimmer circuit breaker
37. Comm radio circuit breaker

38. GPS switch
39. Intercom circuit breaker
40. ADF circuit breaker
41. Marker circuit breaker
42. Radioaltimeter circuit breaker
43. Oil shutters circuit breaker
44. Cowl flaps circuit breaker
45. Antifire system circuit breaker
46. Cabin light circuit breaker
47. Panel light circuit breaker
48. Cockpit light circuit breaker
49. Pitot heat circuit breaker
50. UV lamps circuit breaker
51. Portable lamp circuit breaker (inop)
52. Floor light circuit breaker (inop)
53. Ampervoltmeter
54. Power inverter switch (Left click - main. Right click - aux)
55. Aux power inverter signal lamp
56. Tail wheel lock signal lamp
57. Tail wheel lock switch
58. Left land light switch
59. Right land light switch
60. Navigation lights switch
61. Taxi light switch
62. Strobe lights switch
63. (inop) (Beacon light for airplane where it exist)
64. Generator switch
65. Battery switch
66. Copilot's attitude indicator power switch
67. Pilot's attitude indicator power switch
68. Fuelmeters power switch
69. Engine gauge power switch
70. Oil shutters and cowl flaps indicators power switch
71. Thermometers power switch
72. Air filter shutter lever
73. "Door open" signal lamp
74. COM radio
75. Emergency flaps up switch

76. Flaps position indicator
77. Oil shutters position indicator
78. "Altitude corrector" lever (Mixture)
79. Flaps low button
80. Throttle lever
81. Propeller lever
82. Carburetor heat lever
83. Fuel cut valve lever
84. "Aileron trimmer in zero" signal lamp (+-2 deg.)
85. "Elevator trimmer in zero" signal lamp (+-2 deg.)
86. "Rudder trimmer in zero" signal lamp (+-2 deg.)
87. Rudder trimmer switch (left click - left, right click - right)
88. Rise flaps button
89. Elevator trimmer switch (left click - low, right click - up)
90. Aileron trimmer switch (left click - left wing low, right click - right wing low)
91. Oil shutters switch
92. Cowl flaps switch
93. Lamp
94. Window heat knob
95. Clock
96. Attitude indicator
97. UGK-2 compass
98. Power inverter voltmeter
99. ADF control panel
100. Airspeed indicator
101. Outside temperature indicator
102. "Fast slave" button
103. UV lamps rheostats (inop)
104. ADF indicator
105. Vertical speed indicator
106. Altimeter indicator

LEFT CONSOLE
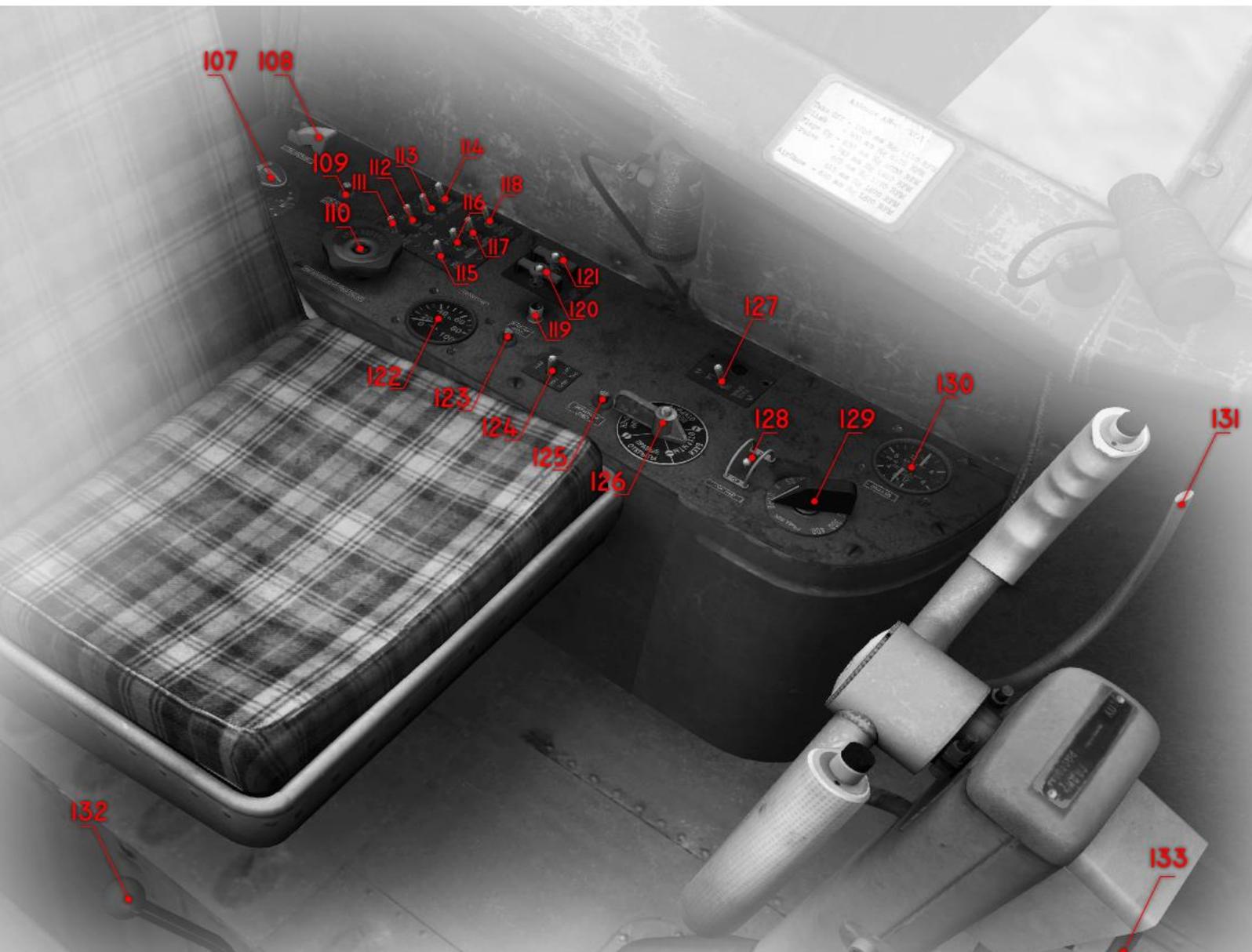
107. Engine primer lever	121. Antifire system check switch
108. Oil dilution system switch	122. Air pressure indicator
109. Low fuel sound signal switch	123. Pitot heat check button
110. Pneumo valve knob	124. Fuelmeter switch (left click - only left tank, right click – only right tank)
111. Fuel low sound switch	125. Chip detector lamp check button
112. Right wiper switch	126. Fuel selector
113. Left wiper switch	127. Cockpit signal lamp switch
114. Wipers circuit breaker	128. Fuel pump switch
115. Left fan switch	129. Radioaltimeter knob
116. Center window heat circuit breaker	130. Wheels brakes air pressure indicator
117. Left window heat circuit breaker	131. Wheels brakes lever
118. Window heat master switch	132. Manual fuel pump lever
119. Pitot heat check lamp	133. Parking brake knob
120. Antifire system check switch	

ADF CONTROL PANEL

a1. Telefone\Telegraf switch (inop)

a2. Level of signal indicator

a3. ADF mode knob

a4. Antenna switch (inop)

a5. Volume (inop)

a6. "Near" channel KHz knob

a7. "Near" channel indication lamp

a8. "Near" channel frequency indicator

a9. "Near" channel hundreds KHz knob

a10. "Near" channel tens KHz knob

a11. "Far" channel KHz knob

a12. "Far" channel indication lamp

a813 "Far" channel frequency indicator

a14. "Far" channel hundreds KHz knob

a15. "Far" channel tens KHz knob

a16. "Near" - "Far" channels switch

ENGINE CONTROLS

Throttle control

The throttle is the outboard lever which is mechanically connected to the carburetor by a flexible push-pull type cable. The full forward position of the throttle is OPEN and the full aft 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]

Mixture control (altitude corrector)

The mixture 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 **backward**, full **forward** is IDLE CUT-OFF, and manual leaning is accomplished by placing the lever between the RICH and IDLE CUT-OFF positions. Actually the An-2's pilots use altitude corrector very rare, on some airplanes it was even sealed in FULL RICH position.

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]

Magneto

The engine magneto switch controls the dual magneto system. There are four switch positions, designated counter-clockwise as follows; BOTH, L, R and OFF. The engine is started and operated with the switch in the BOTH position. The L and R positions are for checking purposes only.

Starter

The starter circuit breaker (7) provides power to the starter control switch (9). Starter switch has three positions: **left** (left click) - provides power to electric motor which rotates the flywheel; **neutral** (right click from the left, automatically from the right) – power off; **right** (right click from neutral) - activates clutch which connects flywheel to the engine's crankshaft.
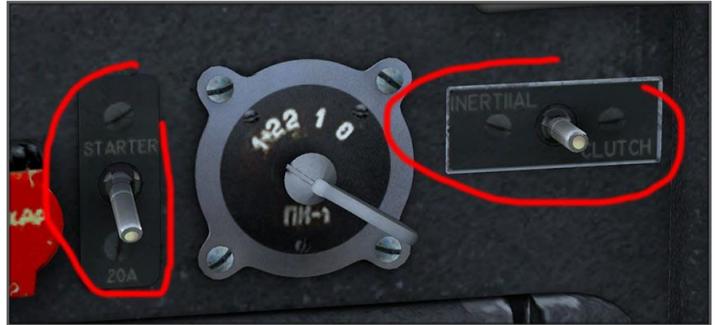
FUEL CONTROLS

Fuel supply system

Fuel is supplied to the engine from two equal fuel tanks located in the upper wing. From these tanks, fuel flows through a fuel selector valve, a manual fuel pump, a boost pump, a fuel strainer, and an engine-driven fuel pump to the carburetor.

Fuel quantity indicator

A direct reading, electrically actuated fuel quantity indicator is mounted in the main pilot's panel (26). Indicator shows whole, left tank or right tank fuel quantity. The mode is chosen by three-position switch (124). Besides that aircraft has a low fuel signal lamp for each of the two tanks to indicate when fuel level is less than 50 liters (21 and 22).

Note: to use fuel quantity indicator battery and circuit breaker (68) must be **ON**.

Fuel selector valve

A rotary type fuel-tank selector-valve handle is incorporated in the fuel system. The fuel-tank selector-valve handle, which controls the fuel selector valve through mechanical linkage, has four positions: **LEFT TANK, RIGHT TANK, BOTH TANKS** and **FUEL OFF**. The **RIGHT TANK, LEFT TANK** and **BOTH TANKS** positions allow fuel to flow from the appropriate tank(s) respectively, to the engine. The **FUEL OFF** position seals both tanks off from the rest of the

fuel system and allows no fuel to pass beyond the selector valve. The fuel selector is rotating clockwise with left click and anticlockwise with right click.

Fuel boost pumps

An-2 has two fuel pumps, manual and electric. The manual pump is operated by lever (132). The electric pump is controlled by an **ON/OFF** switch located on the right-hand side of the instrument panel. It is used to pressurize the fuel system for priming and starting and to provide a back-up for the engine-driven fuel pump during take-off and landing.

FLIGHT CONTROLS

Wing flaps

Wing-flap buttons (79 and 88) control the flaps. To lower the flaps use button on the throttle lever side (79). To raise the flaps use button on the lower left corner of the pedestal.

Note: to operate flaps motors battery and circuit breakers 31-33 must be **ON.**

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

Wing flap indicator

The position of the flaps can be ascertained by looking at the flaps position indicator (76). There are witness marks at 0, 15, 30, 45 and flaps can be selected at these settings or any setting in between.

Note: to use flaps position indicator battery and circuit breaker 70 must be **ON.**

Trim tabs

An-2 has electrical controlled trim tabs for all three control axes. Each trim motor is connected to a three-position control tumbler (87, 89, 90). To indicate neutral tabs positions the airplane has control lamp for each axe (84, 85, 86).

Note: to operate trim motors battery and circuit breakers 34-36 must be **ON.**

Standard shortcuts:
Elevator Trim Down ....[Num Pad 7]
Elevator Trim Up ....[Num Pad 1]

Aileron Trim Left wing low....................[Num Pad 4]
Aileron Trim Left wing up ....[Num Pad 6]

Rudder Trim Left ....[Num Pad 0]
Rudder Trim Right................................[Num Pad Enter]

LOAD MANAGER

Available by Shift+3, allows you to set up fueling and load conditions. Obliviously affects visual model and flight dynamics. Keep in mind that fuel quantity saves from flight to flight and tanks are empty in very first time you load ATS An-2.
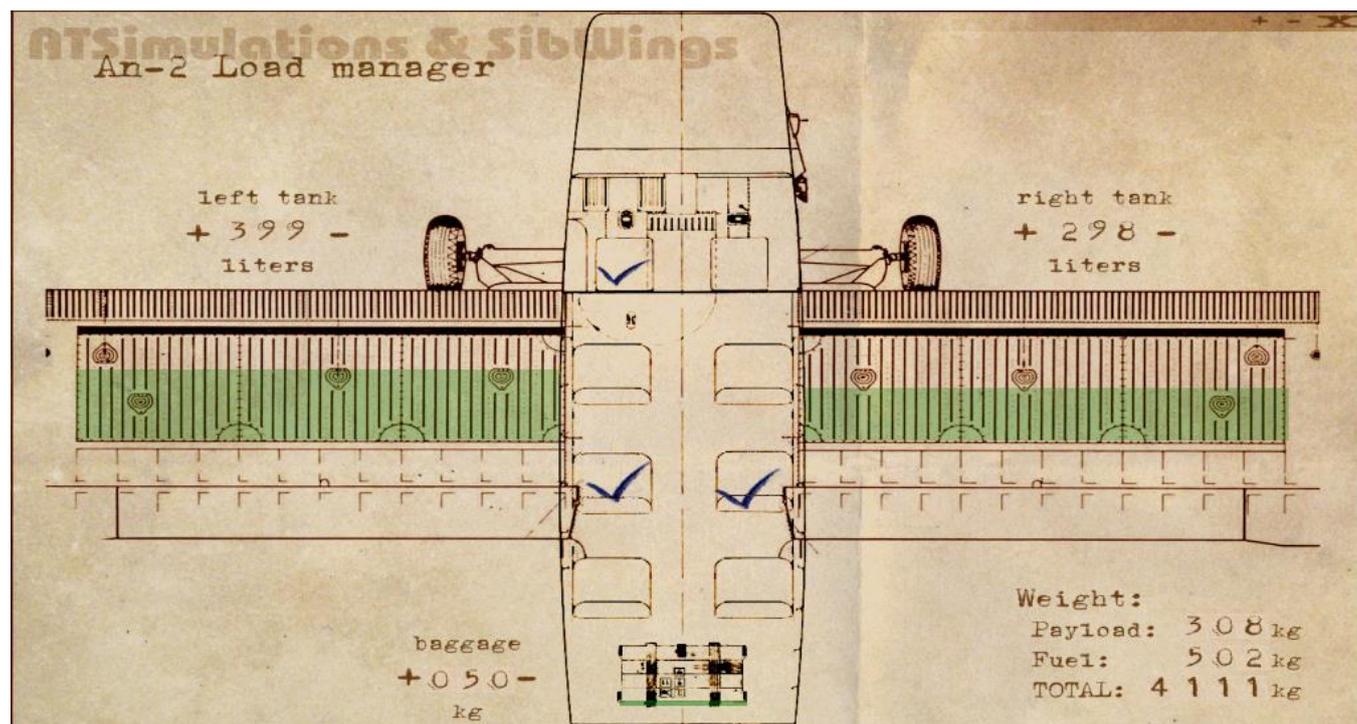
AIRCRAFT MANAGER

Available by Shift+4, allows you to set up parking and flying configuration. Some points available on ground only, some on ground and with engine stop.
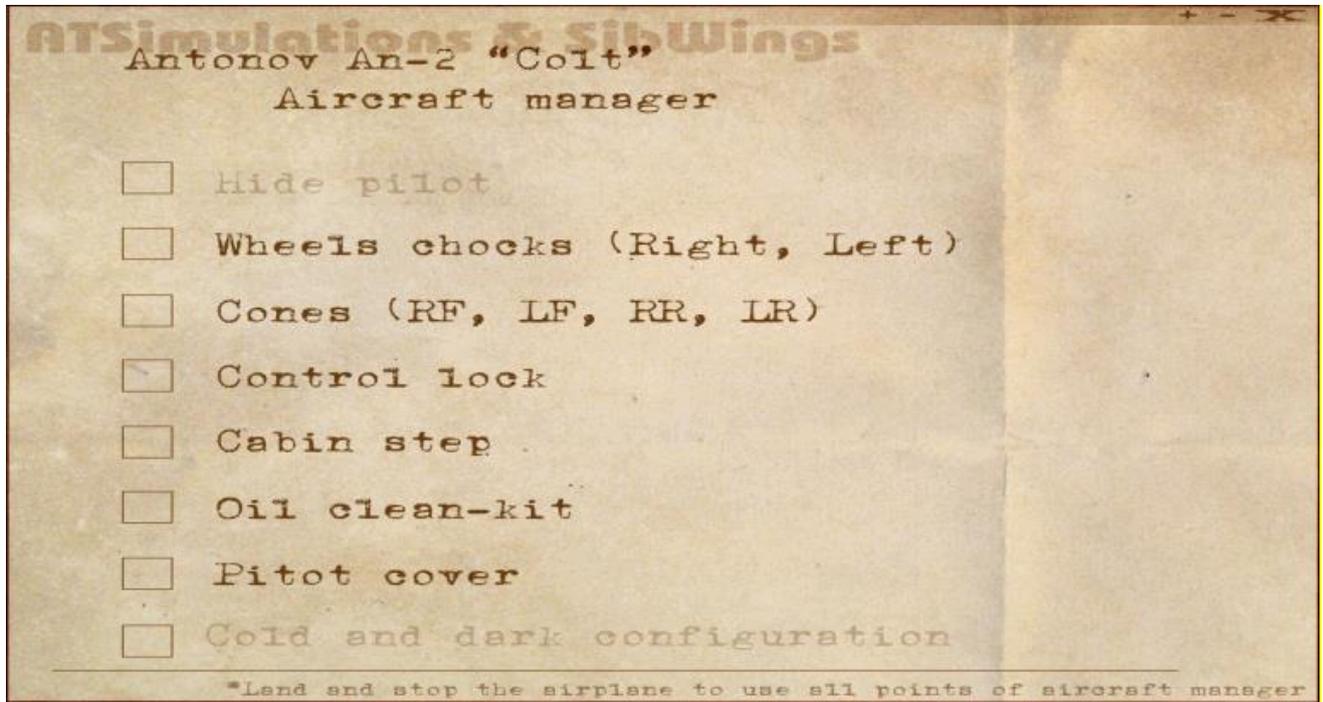
WINDOWS HEAT CONTROL

Flying in cold weather conditions you can faced with windows freezing, to manage that use window heat (tumblers 116-118) and cabin ventilation knobs (on the floor between pilots). Windows icing depends on temperature difference between inside and outside, to control temperature inside the cockpit you have thermometer right behind left pilot head. Just keep in mind that default FSX weather isn't work correctly, mean it could be +20 in Antarctic, so check the outside temperature or set it up manually.

CHECKLISTS AND PERFORMANCE
Antonov An-2

PRE-START PROCEDURES AND CHECKS

Control lock.. REMOVED & STOWED
Parking brake ....SET
Log book, flight doc. & legal forms.. On board
All switches ....OFF
Magneto switch ....OFF
Windows ....CLEAN
Propeller ....CLEAN
Engine cowling latches .... ALL CLOSED & LOCKED
Oil cooler...CLEAN
Dust filter .... Check position
Tires condition & pressure (40 PSI) ....CHECK
Left & right wings... no defects, no gasoline leaks
Pitot cover...REMOVED
Navigation & landing lights glasses ....CLEAN
Side fuselage .... no cracks, no deformations

INTERIOR CHECK – NIGHT FLIGHTS

Battery ....ON
Interior/external lights...all ON – check for serviceability

BEFORE STARTING

Oil collector can .... REMOVED & STOWED
Doorstep .... REMOVED & STOWED
Emergency manhole ....CLOSED & SECURED
Magneto ....OFF
Flight controls ....Freedom of movement
Air system charging valve... OPEN
Air pressure..CHECK > 30
Parking brake ....SET
Brake pressure system ....CHECK > 6
Bus voltage 24V
Battery switch ....ON
Fuel tank meter switch..ON
Engine unit gages switch ....ON

Flap position & oil shutters indicators switch...ON
Oil cooler shutters power switch..ON
Anti-fire system power switch ....ON
Left & Right fuel gages ....ON
Oil coolers shutters & cowl flaps ....ON
Trim tabs .... Neutral
Fuel selector valve .... BOTH
Fire Extinguisher ....CHECK
"Chip Monitoring" button ....Press to test

STARTING ENGINE WHEN HOT

Propeller control ....FORWARD (Low Pitch)
Mixture control .... BACKWARD (Full Rich)
Fuel master valve ....OPEN = FORWARD
Carburetor heater ....OFF
Oil cooler shutter ....CLOSED
Cowl flaps ....CLOSED
Fuel pressure (with manual pump) ....0.25 – 0.35
Primer pump to cylinders...6 injections
MAKE SURE PROP. AREA IS .... CLEAR
Magneto switch ....OFF
"Starting sequence" switch .... ON
Starter... ON - Until 8 ON AMPMETER – Then
toggle the switch to interconnect engine shaft
Magneto switch .... BOTH 1+2

AFTER START

Fuel pressure with manual pump...0.25 – 0.35
Throttle (when engine runs smoothly)... 700 – 800 RPM
Check oil pressure ....Normal > 3
"Starting sequence" switch ....OFF
Generator ....ON
A/C Converter ....ON
Primer pump lever .... LOCKED

BEFORE TAXI

Pax & cargo doors ....CLOSED & LOCKED
All necessary switches..ON
Flaps upper & lower... Operative
Engine control lever positions.. Correct
Indications of engine gages .... Normal "All in the green"

Fuel quantity in each tank ....CHECK
A/C Converter .... Operative
Artificial horizon, course ind.
& gyro compass" switches ....ON
Gyro instruments ....SLAVED
Navigation instruments.. CHECKED & SET
Air pressure in pneumatic system .... > 40
Wheel chocks...CHECK & REMOVED
Tail wheel.. UNLOCKED

TAXI

Lights ....As required
If snow or OAT (< 0°) pitot heat..ON
keep mixture T° > 8° with carburetor heater..ON
All necessary switches..ON
Brakes ....CHECK
In turns, gyro indications... CORRECT

BEFORE TAKE-OFF

Voltage & Load meter ....CHECK
Navigation instruments & Com's...Confirm SET
Carburetor heater ....OFF
Mixture .... FULL RICH
Fuel selector valve .... BOTH
Altimeters ....SET
Gyro compass .... SLAVED & SET TO RUNWAY HEADING
Set trim tabs:
Elevator..DOWN: If heavy for 10°; if not 3 - 5°
Rudder ....RIGHT for 3°
Flaps... set for take-off (usually 15°)
Artificial horizon..CHECK normal indication
Engine gages .... normal indications: "all in the green"
Cowl flaps & Oil cooler shutters ....OPEN
Lights ....AS REQUIRED
Take-off time ....Recorded
Parking brake ....Released

TAKE-OFF

1. Without flaps:
Engine parameters .... 9 / 2100
Speed up to... 140 Km/h 75 Kts

1. With flaps (wind <20 Kts): reduces take off distance by 35%

If 15°: engine .... 9 / 2100

If 25°: engine .... 9 / 2100

If 30°: engine (max weight) .... 10.5 / 2200

Rotation speed .... 85 - 90 Km/h 48 Kts

Sped up to .... 120 Km/h 65 Kts

Flaps over 150 Ft .... gradually drawn-in

Full drawing of flaps at .... 140 Km/h 75 Kts

CLIMB

Establish initially .... 9 / 2050 (9 / 2100 if urgent)

When altitude > 150 Ft .... 8.5 / 1850

Speed .... 140 – 150 Km/h

Oil T° < 70° ....CHECK

CHT < 215° ....CHECK

Lights .... Considered

CRUISE

Oil T° 60° - 75° ....CHECK

CHT: 120° - 215° (recommended: 150° - 215°) ....CHECK

Oil Pressure 4 - 5 ....CHECK

Fuel Pressure 0.25 - 0.35 ....CHECK

Compressor pressure 45 – 50 ....CHECK

Voltages > 28.5 V & > 75 V ....CHECK

Flaps..0°

DESCENT

Establish..5.2 / 1500 (= 180 Km/h 97 Kts)

Maximum speed for descent:

Quiet air .... 220 Km/h 119 Kts

Turbulent air .... 190 Km/h 102 Kts

Maintain .... CHT > 120° & Oil T° > 50°

Carburetor heater if OAT < -15° .... ON

Fuel selector.. BOTH

Parking break ....CONFIRM OFF & PRESSURE IN BRAKES "0"

Air pressure > 40 ....CHECK

Flaps...AS REQURED

FINAL CHECK

Throttle .... < 5

Propeller .... FULL PITCH

Speed .... < 140 Km/h 75 Kts
Flaps.. CHOOSE SETTING (usually 15°)
Landing lights .... ON
Tail wheel locking.. CONSIDERED

FINAL CHECK

Tail wheel.. UNLOCKED
Landing lights ....OFF
Taxi light... CONSIDERED
Pitot heat ....OFF
Flaps...0°
Cowl flaps & Oil cooler shutters .... OPEN

COOLING DOWN & SHUT DOWN

Avionics switches ....OFF
Throttle .... 700 - 800 RPM
Cowl flaps & Oil cooler shutters .... OPEN
Let CHT cool down .... < 120°
Electrical switches & radios.. OFF
For a few seconds: throttle ....1700 RPM, then 800 RPM
Fuel master valve ....CLOSED
Throttle ....OFF
Cowl flaps & Oil cooler shutters if T° < 100 ....CLOSED
Air system charging valve...CLOSED
Controls & ailerons .... LOCKED
Oil & Air system purges...DONE

EMERGENCY PROCEDURES: ENGINE FIRE

Fuel master valve ....CLOSED
Fuel selector..CLOSED
Magnetos & Converter...OFF
Cowl flaps ....CLOSED
"FIRE" Button .... PRESSED

CONTACTS

If you have any questions, comments, suggestions, or need any additional information concerning the Antonov An-2 add-on, please email: info@atsimulations.com

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