

SA316B Alouette III

User manual v1.7



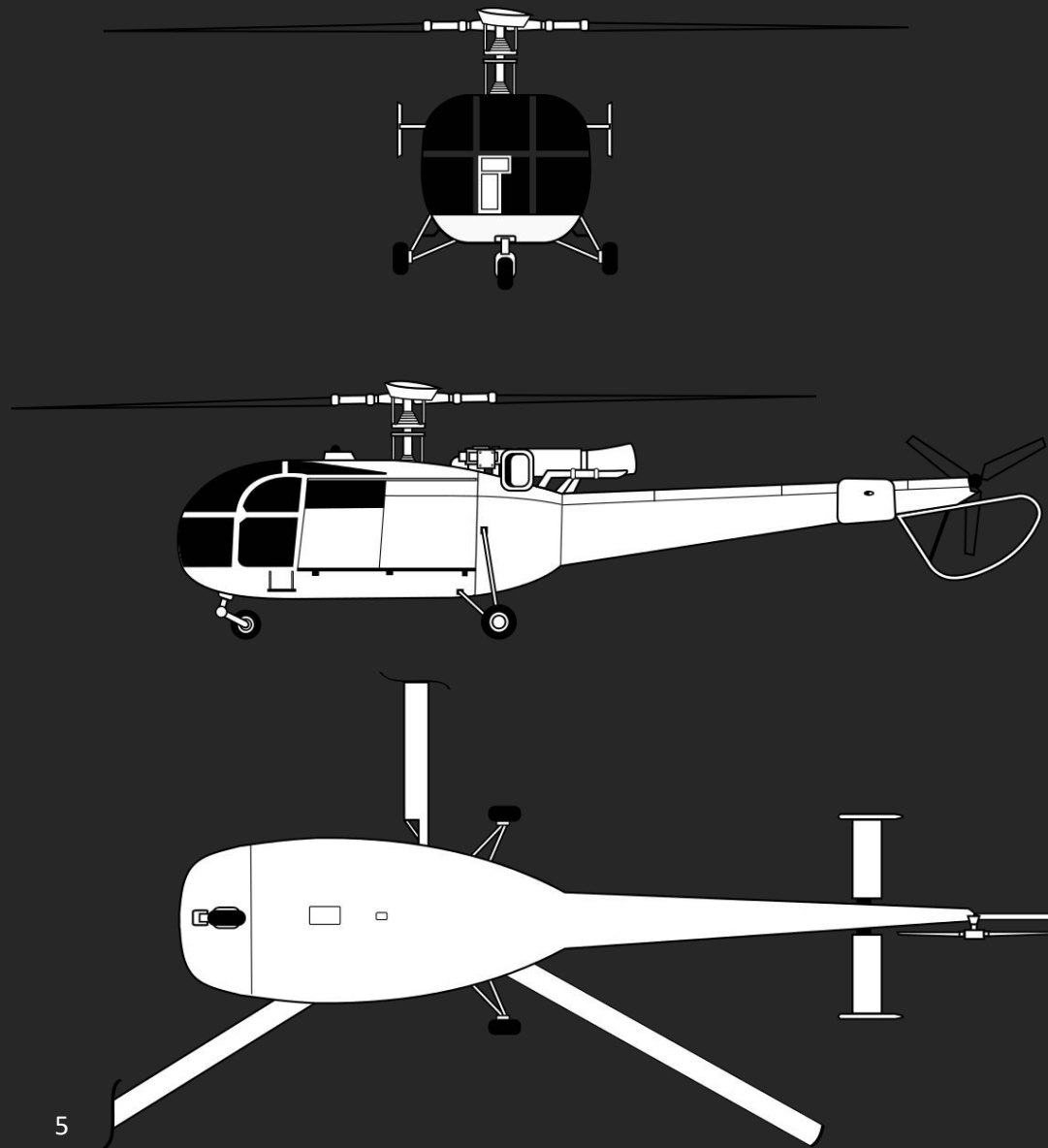
Thanks:

- The **Museu do Ar** for letting us record the real sounds of the Alouette III in their great Museum in Sintra, Portugal!
 - <https://www.museudoar.pt/>
- **Fred** from **Airland Studios** whose help allowed to have a great flight model:
 - <https://airland.world/>
- **Sergio** from HeliSimmer.com for his immense support
 - <https://www.helisimmer.com/>
- All **my community** on Discord for their involvement and passion
 - <https://discord.gg/K8s8EXpAzM>

- Leo_DRZ from Discord for letting me use his custom recordings of the startup sounds as well the cabin ambient sounds,
- TheDude9974 for creating the amazing Intermountain Flight livery.
- HB-XDG from Discord for his valuable real-life insights on the Alouette
- The IRL pilots of the Alouette that gave me great inputs on how to improve this addon.

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1. Introduction

The Alouette III was designed based on military specifications, to succeed the Alouette II. This single-engine aircraft, with a large reserve of power and a large cabin, did not fail to interest very quickly the various actors of mountain rescue.

The Alouette III has met with enormous success, both in Europe and in the rest of the world, where many examples are still in operation in both civilian and military circles. Sold in nearly 1,500 units, the Alouette III was one of the most sold series.

The SA3160 prototype equipped with an Artouste IIIB turbine takes off for the first-time time on February 28, 1959. Marketing began in 1961. In June 1960, one of the very first examples landed and took off with seven passengers on board, at the summit of Mont Blanc (4,810 m.). In November of the same year, the same aircraft landed at an altitude of 6,004 meters in the Himalayas with two people on board and a payload of 250 kg. This feat provoked great international interest in this helicopter. On August 7, 1967, the first winching was successfully carried out by a Civil Security crew at the summit of Grépon (3,482 m.) in the Mont-Blanc massif. This success opens new perspectives, but it will be necessary to wait until the 1970s for the use of the winch to be generalized.

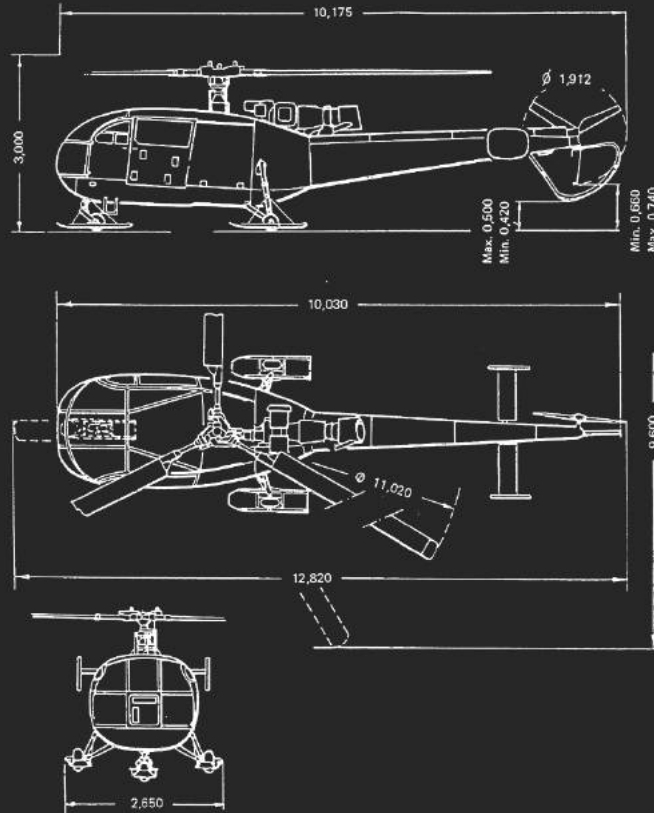
In June 1968, the SA 316B version equipped with an improved rotor was born, still powered by the Artouste IIIB. The experimental SA 319B helicopter is directly developed from the SA 316B. It is equipped with an Astazou XIV type turbine of the same power but with improved thermal efficiency and reduced consumption. The device is mass-produced from the year 1973.

The aerodynamic fuselage of the Alouette III is entirely streamlined. The fully glazed cabin has four doors, two of which are sliding. The seating arrangement can easily be changed. The fixed three-wheel landing gear can be equipped with skis or floats.

The Alouette III is renowned for its excellent maneuverability and great stability in flight. This model enjoys an unrivaled aura among the public, who associate it with mountain rescue. In the French Gendarmerie, the Alouette III replaced its little sister in 1963, and very quickly, the aircraft established itself as the essential helicopter for mountain rescue.



2. Plans



- Interior fittings

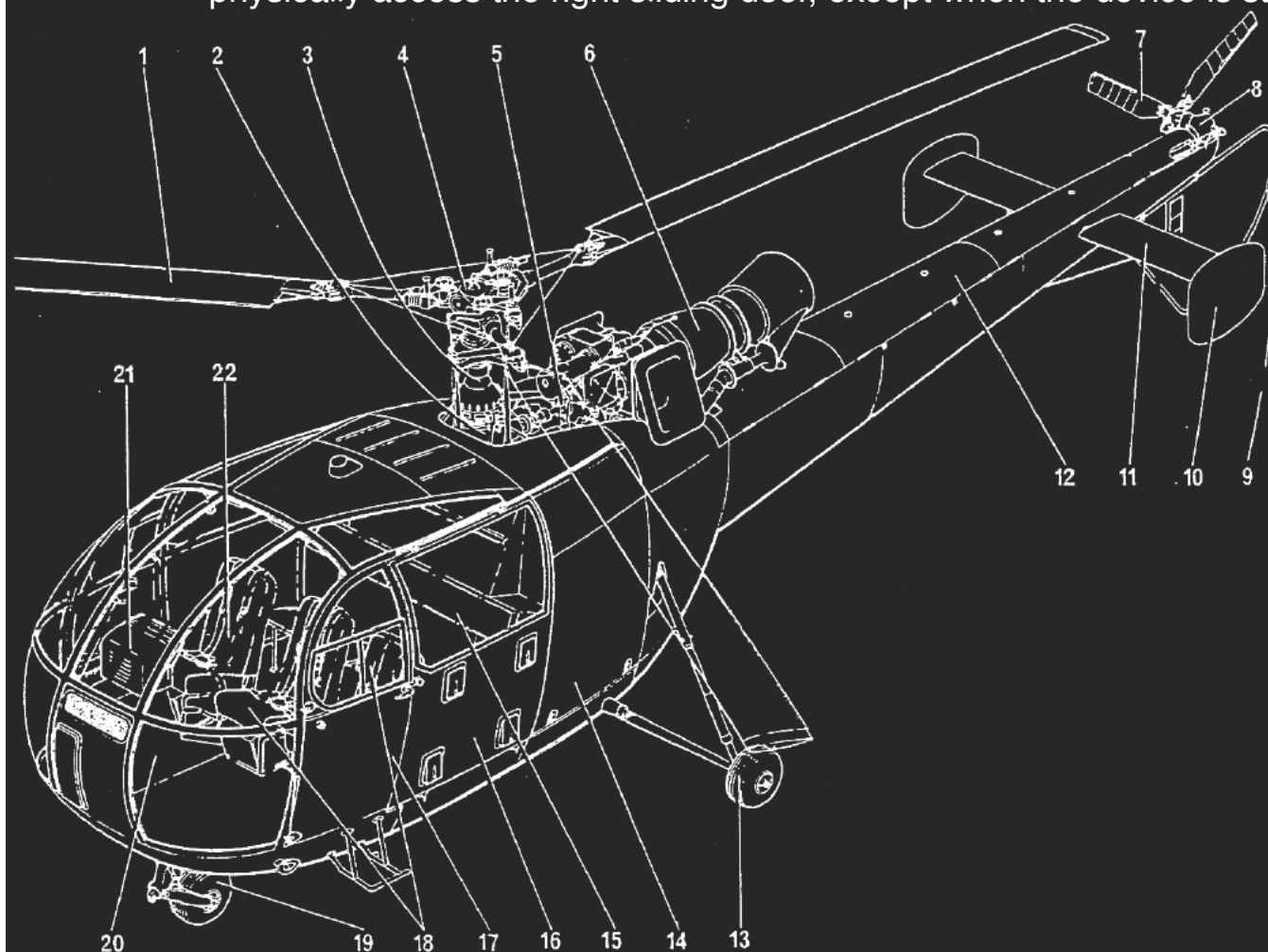
In theory, the Alouette is capable of carrying a pilot accompanied by six passengers. The cabin is separated into two distinct parts.

- The first, located at the front, includes the cockpit, with the pilot's seat on the right, a mechanic's seat in the central seat, and finally a seat turned upside down in the left seat, intended for the mechanic during the winching phases, or for the doctor when returning to hospitals. On the back of this seat is fixed an oxygen bottle. The double controls are dismantled permanently, in order to save space.

- The second occupies the space between the two side sliding doors. The rear seat is removed to be able to install a stretcher across the width of the device. In this case, the rescuers find

themselves in an uncomfortable position since they must step over the victim during the return flight. The floor is covered with aluminum sheets as protection against spikes.

- Two compartments located along the tank, under covers, accommodate medical equipment. The Alouette III is equipped with two sliding doors at the rear. Embarkation and disembarkation are always done on the left side of the aircraft for convenience. The mechanic, whose role is to monitor and open the doors, cannot physically access the right sliding door, except when the device is stopped.



- | | |
|--------------------------------------|------------------------------|
| 1. Main blade | 12. Rear transmission |
| 2. Main gearbox | 13. Rear undercarriage |
| 3. Rotor mast | 14. Baggage compartment door |
| 4. Main rotor hub | 15. Back seat |
| 5. Power take-off, clutch, freewheel | 16. Sliding rear door |
| 6. Turbo-engine group | 17. Front door |
| 7. Tail blade | 18. Front seats |
| 8. Rear gearbox | 19. Front Lander |
| 9. Kickstand | 20. Desk |
| 10. Drift | 21. Dashboard |
| 11. Fixed horizontal plane | 22. Pilot seat |

3. Flight characteristics

Performances

In standard atmospheric conditions, at its maximum take-off weight of 2'100 kg, the helicopter has a cruising speed of 150-180 km/h, while the never exceed speed at sea level is 210 km/h. Its absolute service ceiling is 6'500 meters.

At its MTOW the helicopter hovers in ground effect at about 4'250 meters, or 2'000 meters out of ground effect. The initial rate of climb is about 330 m/min.

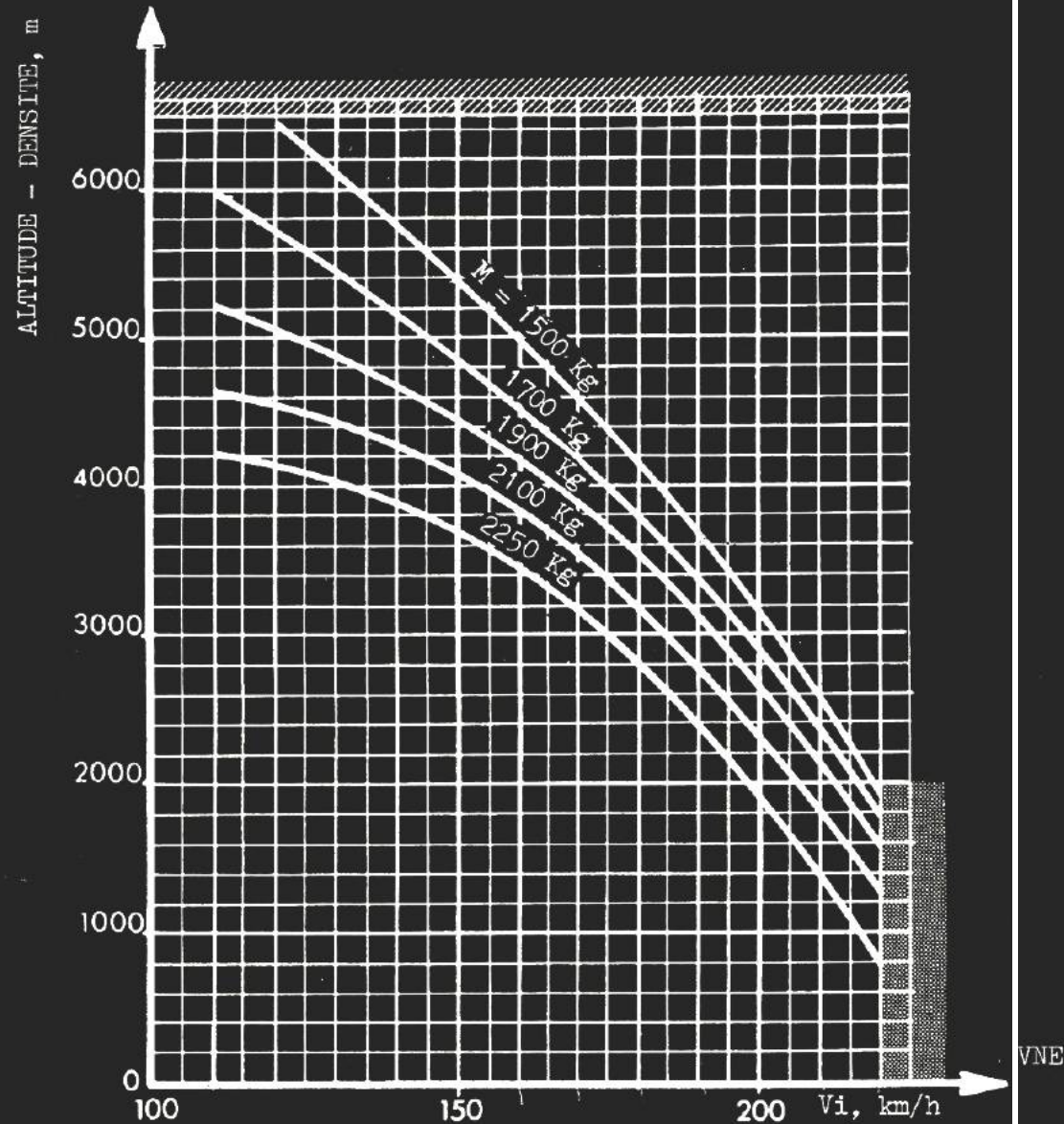
With an average hourly fuel consumption of 200 liters, its range is about 500 km, corresponding to 2h45min of flight endurance.

Dimensions, weights and payload

The main rotor of the SE 3160 Alouette III has a diameter of 11.02 m (disc rotor area 95 m²), while its tail rotor has a diameter of 1.91 m (rotor disc area 2.87 m²). The fuselage has a length of 10.14 m. The height measured on the top of the rotor mast is 2.97 m.

The aircraft standard empty weight is about 1'105 kg, while its MTOW is 2'100 kg.

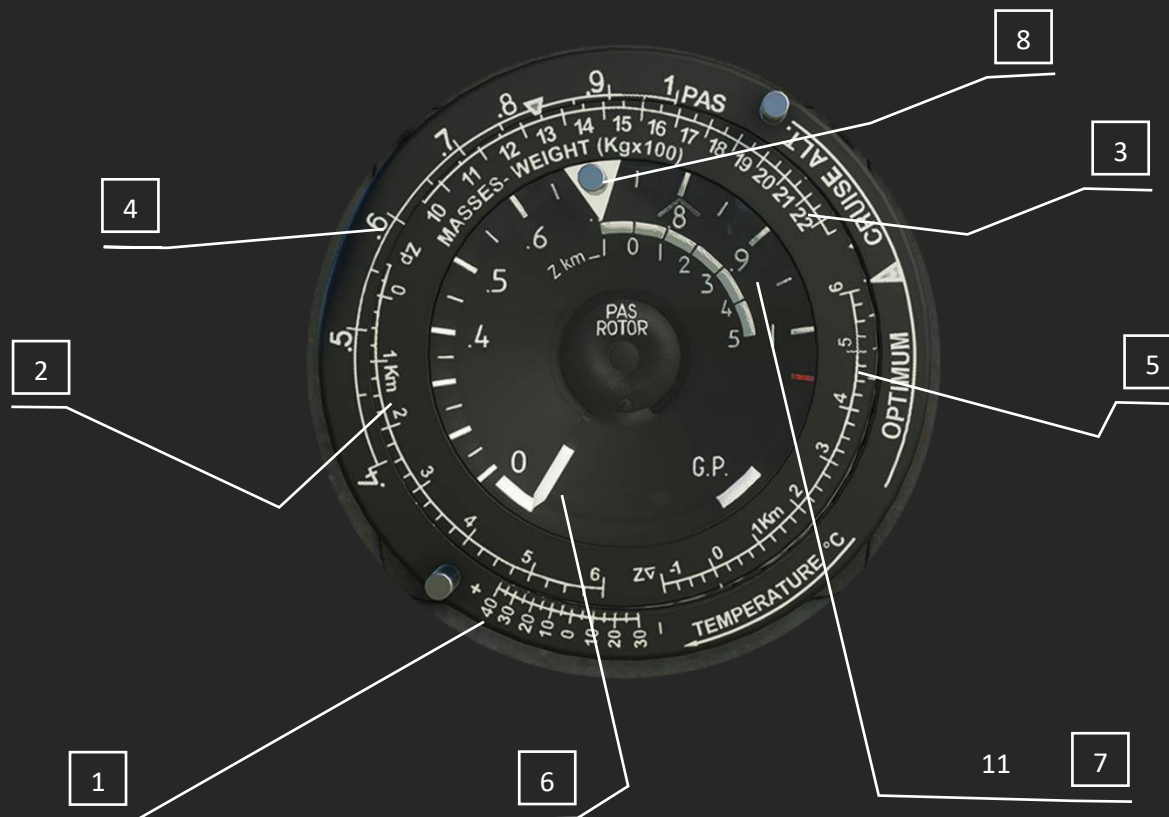
Allowing for a standard pilot weight (77 kg) and with a fuel and oil reserve for one hour of flight (about 184 kg) the helicopter could carry six passengers with their baggage. On its barycentric hook it could carry up to 750 kg.



4. Instruments

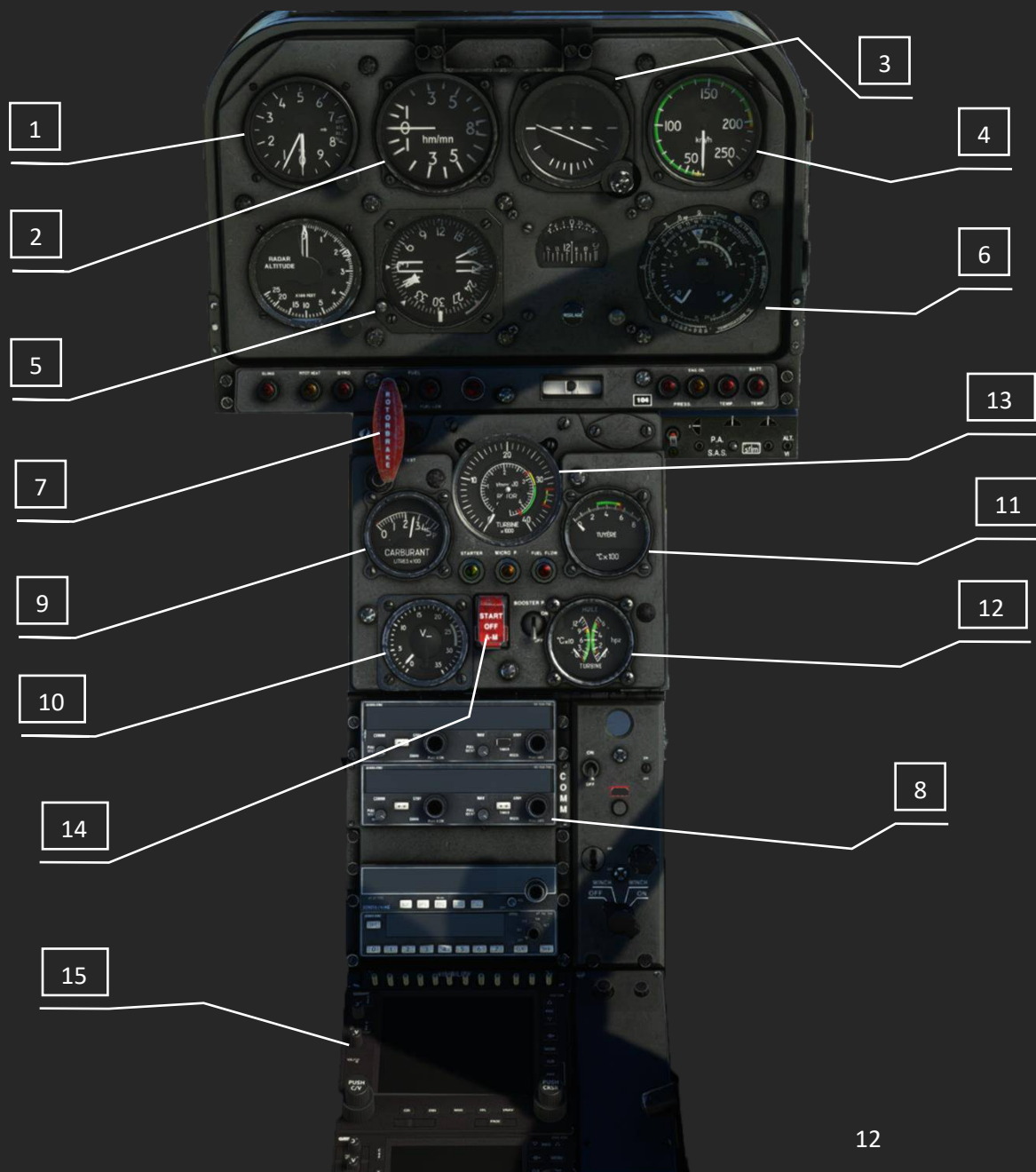
Revolutionary in its time, the Alouette III is equipped with a general pitch indicator (angle of inclination of the rotor blades) with an integrated computer, allowing the pilot to know the limits not to be exceeded during flights. Its operation is relatively simple.

- 1 - Match the Outside Temp with the actual Flying Altitude
- 2 - Read the Density Altitude from the "optimum cruise altitude scale" and match the inner triangle to that density altitude on the inner "Z km" scale
- 3 - During flight - don't pull a higher pitch then the triangle shows. Means the needle must not exceed the triangle
- 4 - Max weight for this condition can be read on the "masses" - weight Scale



Pitch Indicator Computer

1. Outside temperature in °C.
2. Pressure altitude in meters.
3. Weight of the aircraft in kg.
4. Pitch required to achieve stationary flight.
5. Optimal altitude for cruising flight.
6. General pitch indicator needle (GP).
7. Maximum general pitch usable based on altitude.
8. Reminder triangle



Alouette III - SA 316B

1. Altimeter
2. Vertical speed indicator
3. Artificial horizon
4. Airspeed indicator
5. Compass
6. Pitch indicator
7. Rotor brake
8. Radio Stack
9. Fuel gauge
10. Battery voltage
11. Exhaust temperature (T4)
12. Oil temperature and pressure
13. Rotor RPM indicator
14. GTM starting system
15. GPS Stack

5. Main rotor

The transmission

The purpose of the transmission is to transmit the power developed by the engine to the main rotor and tail rotor, while reducing the rotation speeds. It is made up of the following components:

- a coupling shaft, fixed on one hand to a clutch and on the other hand to the main transmission box (MTB), transmitting the engine motion. It is equipped with a freewheel for autorotation.
- a centrifugal clutch synchronizing the turbine and rotor speeds at the coupling shaft level.
- a main transmission box distributing the motion to the main rotor and tail rotor. It includes a two-stage reducer with planetary type gears.
- a mechanically operated rotor brake, controlled by the lever located in the cockpit.



The rotor head

With a diameter of 11.02 m, the rotor rotates from left to right. It includes the main rotor hub and three blades. The Alouette III rotor head is of the "articulated" type, as it includes, in particular, a flapping articulation (vertical movements), a dragging articulation (horizontal movements), and, of course, a pitch articulation, in order to be able to pilot the helicopter in all directions.

The rotor hub is mounted directly at the end of the rotor mast. It includes:

- the hub
- the three blade-carrying sleeves
- the three drag dampers
- the blade tension cables
- the centrifugal stops which prevent the blades from descending too low when stopped.

6. Tail Rotor

The tail rotor (rotor anti-couple or RAC) of the Alouette III helicopter has a diameter of 1.912 meters and is made up of a rear rotor hub (MRA) with three metallic blades that are articulated. The rotor has two types of articulations: pitch articulations, which allow the intensity of the thrust to be controlled by varying the pitch angle of the blades collectively using the pedals, to counter the effect of the torque generated by the main rotor or to rotate the helicopter around its yaw axis; and flapping articulations, which compensate for the effects of dissymmetry of lift between advancing and retreating blades.

The transmission shaft from the main gearbox is sent to the right side of the helicopter via the rear transmission gearbox (BTA) that supports the rear rotor hub. The interior of the BTA is equipped with a gear reduction system that reduces the rotational speed of the tail rotor to 1965 rpm. The transmission shaft is guided from the main gearbox to the BTA by bearings, and pulleys guide the control cable of the pedals from the cockpit to the pitch control drum of the rear transmission gearbox.

The tail boom of the helicopter has two fixed fins with vertical stabilizers that help to maintain stability during forward flight. The small size of the fins minimizes the wind resistance, which is an advantage during crosswind conditions. A skid protects the tail rotor from the ground.



7. Engine and APU

The Alouette III was developed in two different versions, namely the SA 316B, equipped with an Artouste IIIB turbine, and the SA 319 B, powered by a more powerful and fuel-efficient turbine, the Astazou XIV. The latter is mainly used on helicopters devoted to mountain rescue for obvious reasons. The Alouette III is powered by a generation of turbomotors of the type "turbine linked to the compressor" requiring the use of a clutch.

Operation of a linked or solidary wheel turbine:

The turbine is composed of the following main elements:

- a centrifugal compressor with stages.
- an annular combustion chamber with injection of a combustible gas mixture.
- an axial turbine with two stages providing energy to a drive.

The main characteristic of this type of engine compared to so-called "free" turbines is the presence of a single horizontal shaft connecting these different elements. The rotation of only one of these elements necessarily drives the others. Therefore, as soon as the turbine starts, the take-off unit located at the front of the engine is also set in rotation. The clutch protects the turbine from excessive torque at the beginning of the rotor drive.

The take-off unit located at the front is set in motion by means of a reducer which reduces the GTM speed from 43,000 rpm to 6,334 rpm.

The Artouste IIIB and Astazou XIV engines are certified for a maximum thermal power of 870 hp. However, the GTMs are de-rated (load reduction) for mechanical stress reasons on the transmission elements.

The Astazou XIV version, although certified for the same power as the Artouste IIIB, was created to improve thermal efficiency and reduce fuel consumption. This new version has concrete advantages: a lower fuel requirement, and therefore a lighter weight at takeoff.



8. Winch

The Alouette III, in its mountain configuration, is equipped with a winch. Two versions of winches have succeeded each other. The first, using a pneumatic system coupled to the turbine, has a significant disadvantage by causing a noticeable loss of engine power. This pneumatic version is quickly abandoned in favor of a new generation of electric winches with improved characteristics. To this day, this version equips not only the Alouette III but also the Lama and the Ecureuil.

The winch is fixed on a bracket on the left side of the aircraft. During winching operations, the mechanic sits in the left front seat facing backwards. A hatch in the floor, located directly above the path of the winch cable, lowers to facilitate the boarding and disembarking of personnel. Due to lifting capacity constraints, it is impossible to winch more than one person at a time. The hoisting of a casualty in a "Puiguill em" type stretcher always takes place without the accompaniment of a rescuer.

The end of the cable is equipped with a single hook topped with a yellow wheel for easy gripping. The low weight and reduced size of these elements allow for one-handed attachment or detachment, which is a definite advantage when rescuers are on narrow walls. Unlike the EC145, which requires the use of an interface, the harnesses of the people to be hoisted are directly attached to the hook.



9. Maintenance

For the Alouette III, it is customary to say that every hour of flight is followed by an hour of maintenance. Mechanics must therefore assume a heavy responsibility, directly affecting flight safety. Several maintenance operations must be distinguished:

- The routine maintenance, which includes many greasing operations to be carried out upon the return of each mission, cleaning of the cockpit canopy, washing of the fuselage, possibly associated with cleaning the rear part of the cabin. The rotors, transmission, and cyclic pitch assemblies require lubrication every 5 hours, due to non-self-lubricated bearings and bearings as on the EC145.
- Regular inspections, which are scheduled at intervals of 50, 100, 200, and 500 hours, requiring more or less prolonged shutdown of the aircraft. The major inspections, commonly known as "GV," are carried out with the Technical Support Group (GST) of the Gendarmerie located in Blanc. This type of inspection can last several months due to the complete dismantling of the helicopter and the replacement of certain major assemblies.

During planned maintenance operations, certain categories of parts are checked, cleaned (such as filters), or exchanged. All parts have a limited lifespan (potential), which requires their imperative replacement for obvious safety reasons. Some flight parameters are also checked to verify, for example, their agreement with the indications provided by the instruments on board. These checks can be performed with the rotorcraft turning on the ground or during technical flights.

Tests to detect the presence of water in the kerosene are regularly carried out, both in the fuel tanks and in the aircraft's reservoir.

Finally, the winch also requires specific maintenance, such as cable replacement, winding and unwinding the entire length of the cable, as well as checking the pyrotechnic device and the hook attachment



10. Visibility of attachments:

Use the clipboard located on the left side of the main console:

PILOT BODY	☐	☐	COPILOT BODY
SKIS	☐	☐	UHF ANTENNAS
ELEC. WINCH	☐	☐	PNEUMATIC WINCH
BOX LEFT	☐	☐	BASKET RIGHT
MEDICAL CONFIG	☐	☐	SAR CONFIG
SIDE FLOATS UP	☐	☐	SIDE FLOATS DOWN
OPERATOR OUTSIDE WINCH MUST BE ON	☐	☐	RADOME
MEGAPHONES	☐	☐	CENTER ROOF
ENGINE COVERS	☐	☐	ASTAZOU ENGINE
ANTENNAS	☐	☐	COUNTERMEASURES
GLARESHIELD	☐	☐	HIDE ROTORWASH
TRAPDOOR	☐	☐	HIDE HEATBLUR
MIRROR	☐	☐	CHANGE GPS / RADIO
SLING	☐		
BAMBI BUCKET SLING MUST BE ON	☐		

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WHEELS
CONTROL

You also remove the doors now, look for the black and yellow striped handles to remove the doors individually.



Usage of Bambi bucket

- Bind the action **TOGGLE TAXI LIGHTS** to any keybind you want
- Use the visibility board to spawn the sling
- Use the visibility board to spawn the Bambi bucket
- Fly over water and dip the bucket in the water (must be under 25 ft radio alt)
 - o While lifting again you will feel the weight added
- Fly to your target
- Use binding to release the water
 - o Water effect happens
 - o Weight is reset
- Repeat the process

11. Startup guide (or use new in game checklist):

- 1- Turn on the Battery
- 2- Turn on Avionics
- 3- Turn on Attitude Gyro
- 4- Lights and AC Power supply to your own desired setup
- 5- Open the fuel valve lever (bottom pedestal) do not open the fuel flow lever YET
- 6- Turn on the fuel booster pump (main panel)
- 7- Open the start cover and flip the starter switch, (main panel **booster pump must be on**) the green start light should turn on

The Artouste APU should start, the oil temp and pressure warning lights should turn off,

Watch the RPM of the turbine and wait for the RPM to stabilize at 19500 RPM, the starter light should turn off as well as the micro pump warning light.

When the desired RPM is reached:

- 8- Slowly increase the fuel flow lever, (**USE MOUSE**)
- 9- You will see the fuel flow light turn off and the rotor should start turning, keep gently increasing the fuel flow lever up until full Rotor RPM is reached (make sure to push the lever all the way up)

CHANGELOG VERSION 1.7:

- FM Changes:
 - Hover 'hang' slightly less right side low.
 - Less tendency to veer left on forward flight.
 - Collective rate limit added
 - max AOA increased for 13000' HOGE at MOTW
 - GOV speed limit added to smooth out transitions.
 - TR tweaked to give only slight right pedal displacement at hover and align with new pedal SDK options.
 - Main wheel height tweaked to be touching the ground better.
- Various cabin improvements
- New software for Garmin 530
- Fixed various visibility conflicts.
- Improved rotor “slap” sound loop

CHANGELOG VERSION 1.6:

- FM Changes: More tweaks to match real work performance data and allow smoother autorotation as well as a smoother platform landing experience
- NEW: **Inside bays modeled and possibility to open the side panels of the aircraft to reveal the reservoir**
- NEW: Headphones added in the cockpit
- NEW: **Attachments config will be saved and appear in the flight**
- NEW: Seat model reworked
- NEW: 8 Liveries added
 - Black Alouette
 - Trans North
 - Pegasus
 - Life Flight
 - HB-XXM
 - Nepal Airforce
 - Airfast
 - Heli Transport
- Fixed: Cleaning up the central console and pedestal
- Fixed: **The float version can now land on water and not drift**

CHANGELOG VERSION 1.5:

- NEW : Interior wheel centering lever
- NEW : Working wipers
- NEW : Rotor blur 3d model improved
- NEW : Alouette Sécurité Civile 1985 livery
- NEW : Overhead panel textures reworked to match real life closer
- NEW : Attachments
 - Pneumatic winch
 - SAR config (different from medical config)
 - Side floats down
 - UHF Antennas
 - Megaphone siren (overhead panel switch to turn on)
 - Wheel direction arrows
- Fixed : Center console starter and fuel pump now at the correct position
- Fixed : Fuel Pump must be on in order to start
- Fixed : Fuel flow lever can now be pushed all the way down after first use

CHANGELOG VERSION 1.4:

- NEW: Interior textures
 - Panel
 - Overhead Panel
 - Seats
 - Floor
 - Cabin
- NEW: Exterior textures
 - Artouste engine fully retextured
- NEW: Highly detailed 3D model for the Astazou engine attachment
- NEW: Fully fonctionnal bambi bucket (see manual)
- NEW: Two more liveries added
 - ETI 2000
 - Argentinian Armada
- NEW: Reworked sound package
- Fixed: Textures across the aircraft
- Fixed: Some animations

- Fixed: optimization of the package
- Fixed: LODS for the aircraft

CHANGELOG V 1.3.0:

- Added : New board to control the visibility of attachments (switches are not available anymore)
- Added : Possibility to add weight for some of the bigger attachments through weight panel
- Added : Possibility to see Pilot and copilot's body in cabin + pilot's body animated to controls surfaces
- Added : New textures for all characters
- Added : Bambi Bucket + water effect (still WIP not fully fonctionnal)
- Added : New ASTAZOU engine attachment, to have the ASTAZOU turbine in place of the Artouste one
- Added : Reworked outside turbine sounds with new recordings
- Added : Tail rotor rotation sound
- Updated : New thumbnails for better browsing of liveries
- Updated : You can now choose between right and left buckets visibility
- Fixed : Turbine sound pitch and volume changing when lowering collective is not happening anymore
- Fixed : Camera positions to reflect a more real sitting position
- Fixed : Contact point for the tail guard added
- Fixed : Floating red beacon light has been removed
- Fixed : Trap door now still shows when open
- Fixed : External power is available on ground
- Fixed : Position of the operator outside
- Fixed : Skis are now looking like the real life skis of the Alouette III
- Fixed : Civilian texture tail rotor color fixed when rotating
- Fixed : Horizontal stabilizers support beams removed
- Fixed : Normal map is now 8K for more details

- Fixed : Multiple minor fixes around the aircraft

CHANGELOG V 1.2.0:

Flight Model : More Anti torque pedal authority, as advised by real world pilots

Added : New Sling Attachment

Added : New right side bucket attachment

Added : New Radar OMERA ORB-32 attachment outside/inside the cabin (non fonctionnal)

Added : New Engine cover attachment

Added : Possibility to remove doors individually

Added : New Winch 3D model and textures

Added : New upper panel 3D model and textures

Added : New textures for a lot of objects around the cabin

Added : New 3D objects added around the cabin

Added : New liveries x3, Intermountain Flight, and two from the Portugal Air Force

Added : New panel and cabin lightning

Added : New sound package for the startup sequence and cabin ambient sound during flight

Fixed: The windshield is now free of the center roof piece for more visibility

Fixed : The mirror has now its own UV layout and will not get the paint from under the belly anymore

Fixed : Edges of the cabin structure that would show the exterior frame above the pilot are now fixed.

Fixed : Minor fixes of the edges on different parts of the canopy for a smoother look.

Fixed : Navigation lights now have right position

Fixed : Voltmeter now shows the correct value

Fixed : Turbine temp T4 now shows the correct values

Fixed : More accurate placing of the clock under the panel instead of above

Fixed : Left side bucket is now more to the rear to avoid conflict with hoist operations

Fixed : Attachments now take the fuselage colors

Removed : the side step attachment is removed as it was already broken and now side steps are immovable

KNOWN ISSUES V 1.5.0

- For the fuel flow lever, you must use the mouse to interact with it. MSFS for now does not give the possibility to bind this to any axis. **MAKE SURE TO UNBIND ANY TWIST GRIP / THROTTLE**, this will create unwanted behavior if not done.
- Due to the nature of the startup for the Alouette III, it is not possible to fully auto start with CTRL+E
- Water interaction, float version uncontrollable in the water, unable to steer. Only settles once rpm low. (MSFS bug)
- Pilot door makes no sound when closing

