Microsoft Flight Simulator

SA315B LAMA

FLIGHT MANUAL

AIRLAND WORLD

TAOG'S HANGAR

Microsoft Flight Simulator

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1 . Aircraft History and information

Introduction:

The Aerospatiale SA315B Lama is a remarkable helicopter known for its exceptional high-altitude performance and versatility. Developed from the Alouette II, the Lama has found applications in various challenging environments, particularly in mountainous regions.

Origins and Development:

The SA315B Lama is a derivative of the Alouette II helicopter, designed and manufactured by the French aerospace company Aerospatiale. Development began in response to a request from the Indian Air Force in the 1960s for a helicopter capable of operating effectively in high-altitude conditions, especially in the Himalayan region.

First Flight and Certification:

The prototype SA315B Lama took its first flight on March 17, 1969. The helicopter was characterized by its longer rotor blades, increased fuel capacity, and a modified powerplant to enhance its high-altitude capabilities. It received certification in 1970.

High-Altitude Performance:

The SA315B Lama's design modifications were specifically aimed at addressing the challenges posed by high-altitude environments. With its ability to operate at altitudes exceeding 20,000 feet (6,100 meters), the Lama became a go-to helicopter for missions such as search and rescue, medical evacuation, and utility transport in mountainous terrains. The SA315B is the current world record owner of the highest altitude reached with an rotating wing aircraft at an astonishing 12954m or 42500 ft.

Versatility in Operations:

The helicopter's versatility extended beyond its high-altitude capabilities. The SA315B Lama proved adaptable to a range of roles, including crop spraying, firefighting, and aerial construction. Its ability to perform delicate maneuvers and operate in confined spaces made it well-suited for various civilian and military applications.

Here are some of its main characteristics:

- A design comprised of three main parts: the cabin, the center frame, and the tail boom.
- The cabin offers an unrestricted view for the pilot and passengers, with adjustable front seats and overhead sunshades for comfort.
- The instrument panel console is centrally located, with a rigid box-type floor construction for cargo tie-downs.
- It includes a "trip computer" for calculating maximum permissible mass hovering, although it is less used by civilian pilots in practice.

- The center structure houses a large capacity fuel tank and supports a higher landing gear compared to the Alouette 2, with shock-absorbing struts.
- The tail boom supports the stabilizer, tail rotor gearbox, and rotor, with a safety feature for detecting cracks through a color-changing video-pi indicator.
- It has a three-blade fully articulated main rotor and a three-blade tail rotor, with rotor speed maintained at 353 rpm in flight, with acceptable autorotation variations.

Global Deployment:

The SA315B Lama gained popularity globally, with several countries adopting it for its unique capabilities. It became a valuable asset for operators requiring a helicopter capable of handling demanding terrains and altitudes.

Some of the current and former operators of the Lama are:
1. Argentine Army Aviation
2. Argentine Air Force
3. Argentine Gendarmerie
4. Bolivian Air Force
5. Helibras (Brazil)
6. Air Glaciers SA (Switzerland)
7. Air Zermatt AG (Switzerland)
8. Heli Bernina AG (Switzerland)
9. HELOG (Switzerland)
10. Chilean Army
11. Chilean Air Force
12. Ecuadorian Army
13. Helicopter Services Organization (Iran)
14. Pellissier Helicopter (Italy)
15. Akagi Helicopter (Japan)
16. Mexican Government
17. Airlift AS (Norway)
18. Pakistan Army Aviation
19. Evergreen Helicopters (USA)

Legacy and Continued Service:

The SA315B Lama has left a lasting legacy in the world of rotorcraft, particularly in high-altitude operations. While production of new Lamas ceased, many remain in service globally, with operators appreciating their reliability, adaptability, and performance in challenging conditions.

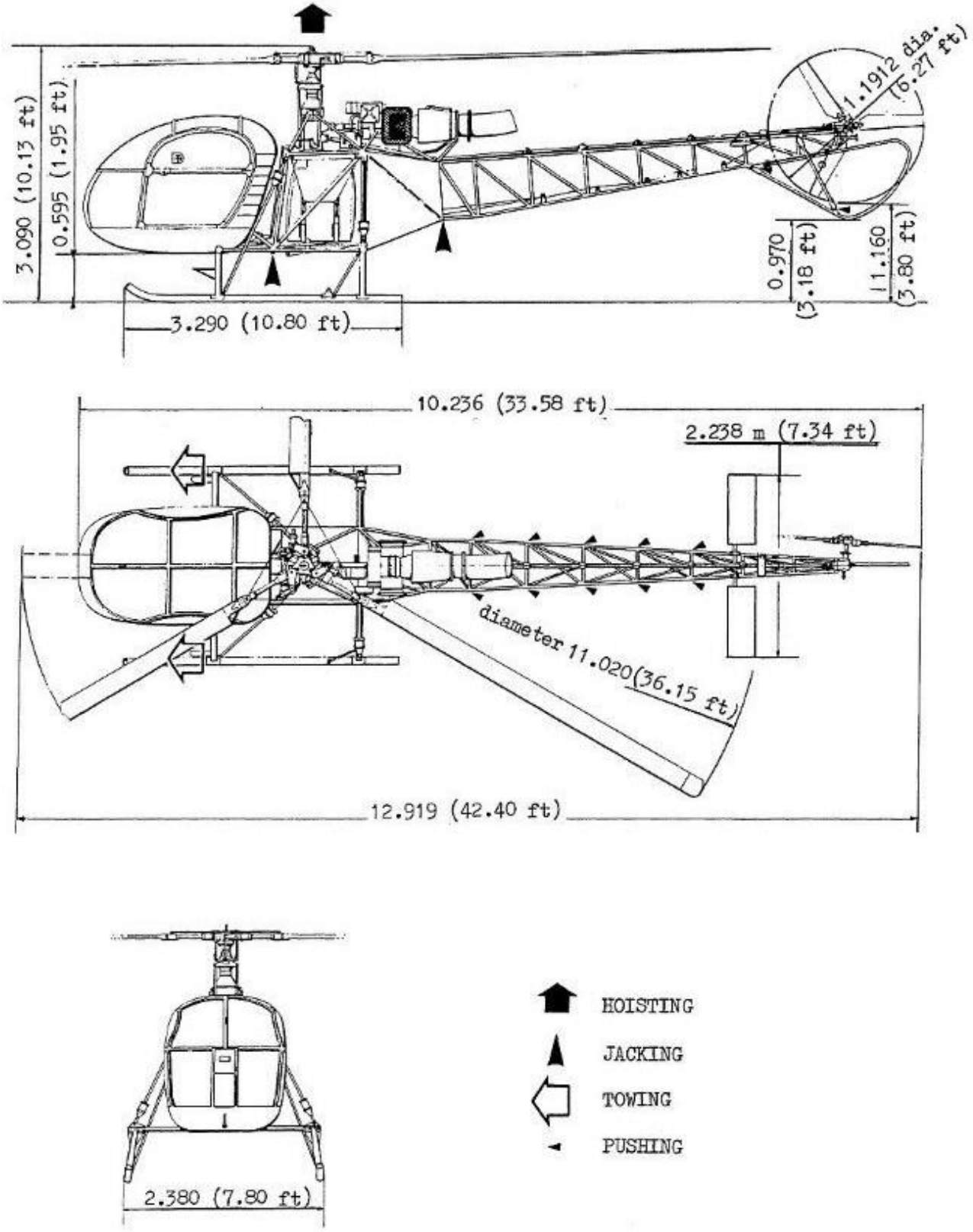
The Aerospatiale SA315B Lama stands out as a helicopter designed to conquer high-altitude challenges. Its legacy lives on through its continued service in various roles, showcasing the enduring impact of its innovative design and engineering.

2. Aircraft’s specifications

Specification	Value
Crew Capacity	1-4 (depending on configuration)
Length	12.19 meters (40 feet)
Main Rotor Diameter	11.02 meters (36 feet 2 inches)
Height	3.09 meters (10 feet 2 inches)
Empty Weight	Approximately 1,150 kilograms (2,535 lbs)
Maximum Takeoff Weight	2,800 kilograms (6,173 lbs)
Engine	Turbomeca Artouste IIIB
Powerplant Output	870 shaft horsepower
Fuel Capacity	600 liters (158.5 gallons)
Maximum Speed	Approximately 120 knots (222 km/h)
Cruising Speed	90 knots (167 km/h)
Service Ceiling	5,700 meters (18,700 feet)
Range	Approximately 360 nautical miles (667 km)

3. Aircraft's Characteristics

Aircraft's diagram



High skid type landing gear

Engine

The Lama SA315B is powered by a generation of turbomotors of the type "turbine linked to the compressor" requiring the use of a clutch. In this case the Artouste IIIB turbine.

Operation of a linked or solidary wheel turbine:

The turbine is composed of the following main elements:

• a centrifugal compressor with stages.

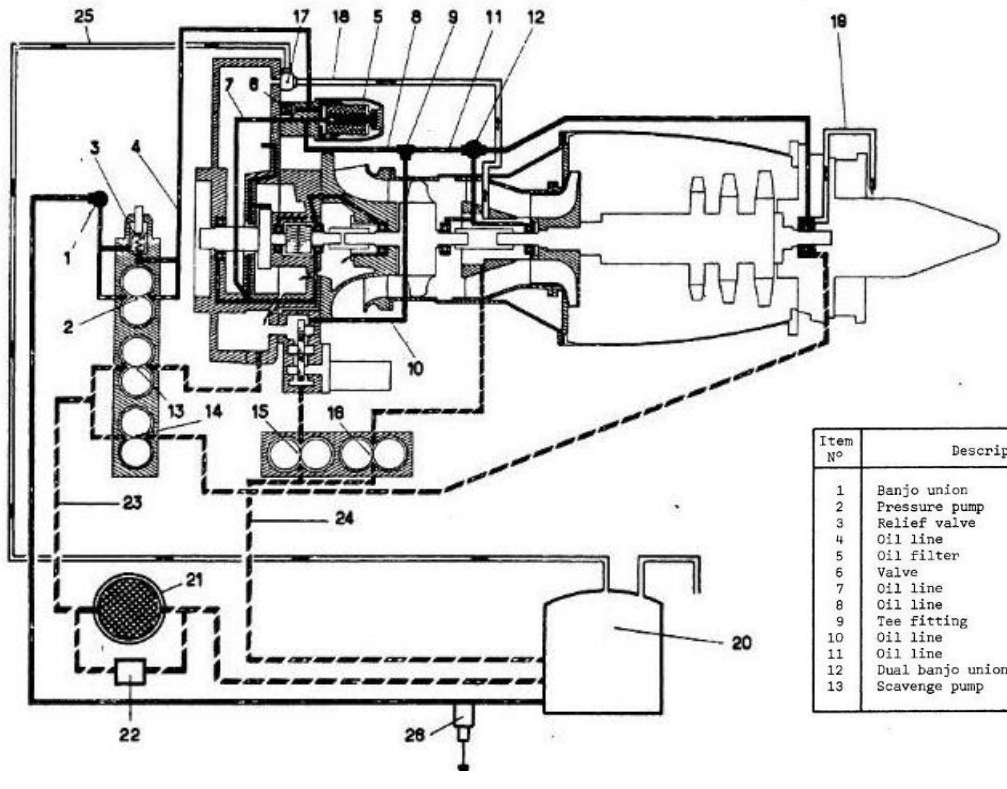
• an annular combustion chamber with injection of a combustible gas mixture.

• 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 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.

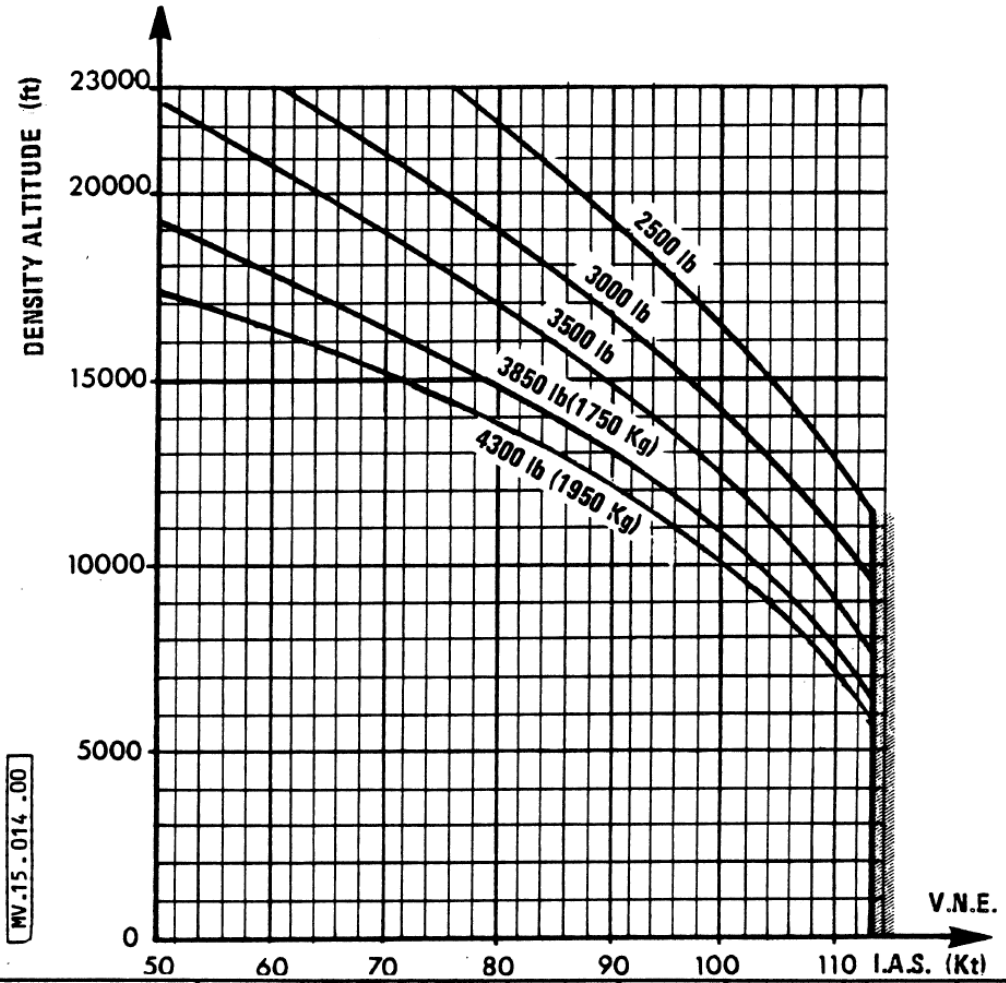


Item N°	Description	Item N°	Description
1	Banjo union	14	Scavenge pump
2	Pressure pump	14	Scavenge pump
3	Relief valve	16	Scavenge pump
4	Oil line	17	Special QUINSON union
5	Oil filter	18	Oil line
6	Valve	19	Rear bearing vent line
7	Oil line	20	Oil tank
8	Oil line	21	Oil cooler
9	Tee fitting	22	By-pass valve
10	Oil line	23	Oil line
11	Oil line	24	Oil line
12	Dual banjo union	25	Oil line
13	Scavenge pump	26	Temperature bulb

Engine oil system diagram
Figure 1

4. Flight characteristics

Airspeed limitations



Density altitude (ft) / Weight (lb)	0 to 3000	6000	9000	12000	15000	18000	21000	23000
4300	113	113	104	91	72			
3850	113	113	106	95	79	58	38	
3500	113	113	110	102	89	75	59	47
3000	113	113	113	107	97	84	70	61
2500	113	113	113	112	104	95	84	76
	Speed in kt							

NOTE : These VNE speeds are approximately the same as cruising speed plus 15 knots.

FLIGHT ENVELOPE

- Maximum operating altitudes:
- Flight: 7000 m (23000 ft)
- Engine starting: 5800 m (19000 ft)
- Engine relight in flight: 5800 m (19000 ft)
- Temperature range: -40° C to +55° C

MINIMUM CREW

- One pilot (on R.H. side)

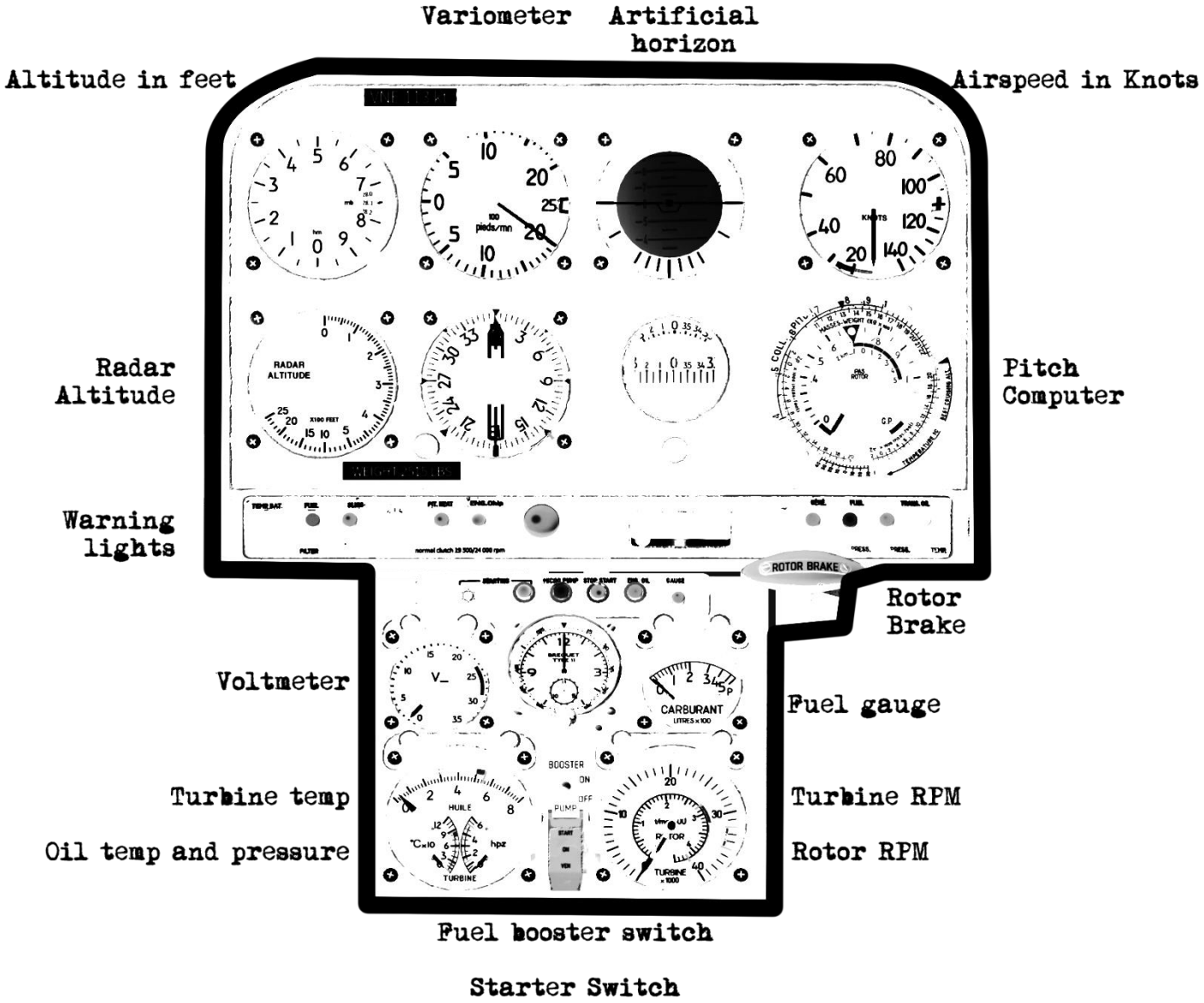
RESTRICTIONS

The following are prohibited:

- Engine starting with a main rotor blade over the tail pipe.
- Aerobatics (in particular, never exceed a 30° nose-up attitude).
- I.F.R. (I.M.C.) flight.
- Flying in icing conditions.
- Prolonged rearward flight, (due to the return of exhaust gases toward the cabin).
- Starting or stopping the rotor to leeward of any building, edifice or other obstruction when wind is in excess of 45 knots.
- Starting the rotor in all cases where wind is in excess of 60 knots.
- On the ground, decreasing rotor r.p.m. by increasing collective pitch to more than 0.20.
- Rapid yaw movements in hovering and vertical climb conditions.
- Deliberate autorotative landing (on ground), for helicopters equipped with floats.
- Harsh manoeuvres such as sharp turns and rapid manoeuvres

5. Cockpit familiarization

Main Panel



Overhead panel

Landing light breaker/ switch

anti-col. lights breaker/ switch

Pitot heater switch
Exterior lights switch

Lights potentiometers

Gyro Breaker

Circuit breakers

Battery switch
Generator switch
Engine heat. switch

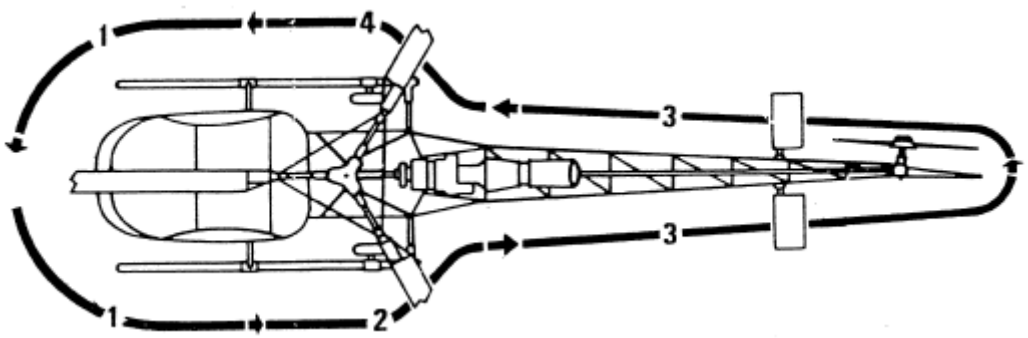
Cabin heating switch
Cabin blower switch
Ermer. Floats switch

6. Procedures

PRE-FLIGHT CHECKS

OUTSIDE THE CABIN

- Side-slip indicator: Check that the woolen thread is installed



BODY STRUCTURE, L.H. SIDE

- Air intake: Check grid or sand filter for security and condition.
- Fuel tank: Bleed before the first flight and after each refueling
- Engine oil tank: Check for level and freedom from leaks

TAIL BOOM, TAIL GEAR BOX

- Tail gear box: Check for level and freedom from leaks and ensure that the filler plug is installed.
- Tail rotor blades: Check for condition

BODY STRUCTURE, R.H. SIDE

- Fuel tank: Check that the filler plug is installed and locked in closed position.
- Main gear box: Checks for level and freedom from leaks.
- Engine: Check for freedom from leaks
- Air intake: Security condition of grid or sand filter
- Fuel filter: Bleed before the first flight. Check that the clogging indicator is in.
- Main rotor blades: Check for condition of leading edge and tip fairing.

PLACE THE AIRCRAFT HEADWIND WITH ONE BLADE FORWARD ON THE AIRCRAFT CENTRE LINE.

CHECK FOR FREEDOM FROM FOREIGN BODIES IN THE VICINITY, LIABLE TO BE INGESTED OR TO CAUSE DAMAGE TO THE ROTORS.

INTERNAL CHECKS BEFORE STARTING ENGINE

- Tail rotor control pedals:
    - ADJUSTED
    - CHECK free travel
- Cyclic pitch stick:
    - CHECK free travel
    - CENTER the control stick
    - HOLD the stick, using the friction lock
- Collective pitch lever:
    - CHECK free travel
    - With the lever against the low pitch stop, TIGHTEN the friction lock fully.
- Doors: CLOSED
- Fuel flow control lever in CLOSED position (against rear stop)
- Fuel shut-off control lever lockwired in FORWARD POSITION
- Circuit breakers: Engaged for needed functions (landing light, gyro compass)
- Switch battery and generators "ON"
- Engine starter switch: OFF
- Rotor brake RELEASED - One main rotor blade FORWARD
- Check: voltmeter (24-volt minimum) and electric instruments (fuel contents gauge, etc...)
- Check warning lights
- Check and adjust: altimeter
- In the event of night flying: check interior and exterior lighting

STARTING THE ENGINE

- Switch the booster pump to "ON" (MARCHE) and wait 20 seconds.
    - Check that the fuel low-pressure warning light goes out.
    - Wait for fuel to flow from the micro-pump drain; should be within 5 to 15 seconds.

- Set the starter switch to "ON" (MARCHE)
- The green "START" (DEM) indicator light should come on.
- The yellow "INJ" indicator light comes on shortly after.
- Crank the fuel flow lever to about 35%

- The turbine engine RPM should stabilize at around 19000 RPM

- Gradually move the fuel flow lever until the main rotor just begins to turn

    - The rotor should start turning between 19500 and 21000 RPM
- Gradually move the fuel flow lever forward to the travel limit stop

TAKE-OFF

Operations | Checks

- Take off without hesitation and maintain hovering flight at 1 metre (3 feet) above the ground.
- Slowly establish forward flight by gradually increasing the collective pitch, without exceeding the maximum pitch corresponding to the density-altitude of the take-off area.
    - Check collective-pitch, and tail pipe temperature (t4).
    - t4 should remain below the t4 limitations given in Section 1, para. 4 and be in accordance with the chart at the top of the instrument panel (see Section 2. para. 14)

- As soon as the transition speed (35 km/h - 20 knots) has been exceeded, it is recommended to gain altitude progressively so that, a power-off landing if required, can be accomplished under the best possible conditions:
    - 5 to 10 m at 50 km/h (15 to 30 ft at 30 knots)
    - 15 to 20 m at 65 km/h (50 to 60 ft at 40 knots) Climbing speed is 95 km/h (50 knots)
    - Tail pipe temperature T4: not to exceed 500°C.

IN FLIGHT OPERATIONS

Cruising

- Economical cruising pitch above 1000m or 3300ft is 0.85. This pitch attitude will allow you to reach the cruising speed of 90 knots
- In straight, steady flight, **the helicopter lists to the right**. The amount of list is depending of the amount of power being used.

Quick Stop

- A "Quick-stop" is performed by applying full low collective pitch, and maintaining constant height above the ground; this will never result in an excessive nose-up attitude (maximum authorized nose-up attitude = 30 degrees)."

DESCENT

- Descent may be accomplished with any collective pitch value provided a rotor speed of 420 r.p.m. is not exceeded (need to maintain collective-pitch margin when flying at altitude with heavily loaded aircraft). Recommended approach speed is 110 km/h (60 knots) for clear landing areas. A lower approach speed should be adopted in the event of a confined landing area being used.

LANDING

- From a hovering attitude, land without hesitation and apply full low collective pitch.

AFTER LANDING

STOPPING

- Fully retard the fuel flow control lever. Apply the friction controls. Shut down the engine by moving the fuel valve to "OFF".
- At 175 r.p.m., apply the main rotor brake.
- Switch off the radio, booster pump, battery and generator.

STOPPING THE ROTOR WITH ENGINE RUNNING

The rotor can be stopped without stopping the engine, provided that there is no clutch drag ; proceed as follows :

- Set the fuel flow control lever in fully closed position and wait for rotor speed to fall below engine speed (check indicator pointers).
- Apply the rotor brake at 175 r.p.m. ; partially release the brake just before the rotor stops, in such a way that one of the rotor blades comes to rest forward.
- Release the brake completely and check that the clutch has no tendency to drag. If the rotor starts to rotate or creep, either :
    - Switch the engine off
    - or accelerate the engine to ensure full clutch engagement.

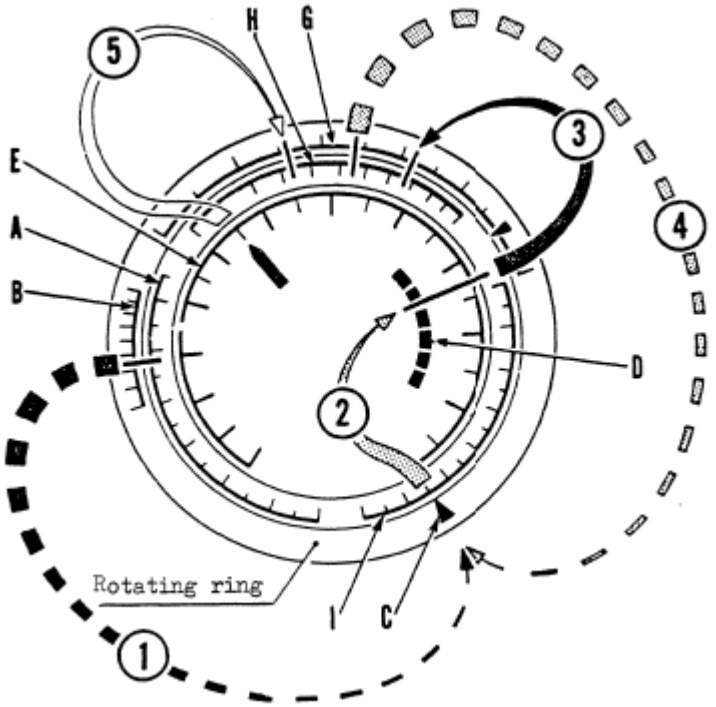
USE OF THE COMPUTER

The computer surrounding the collective-pitch indicator is used to determine various parameters, as follows:

1 Density-altitude:

- By means of the rotating ring, line up:
    - The O.A.T. value (scale B) transferred from the O.A.T. indicator.
    - The pressure altitude (scale A) transferred from the altimeter set at 1013 mbars.

- Read the corresponding density altitude value on scale I opposite arrow C.



2 Maximum permissible collective pitch for hovering.

- Determine density altitude as specified in para. (1) above.
- Convert the density altitude figure into km (or thousands of feet), transfer the result to scale D, then read opposite, on scale E, the maximum permissible collective pitch for this density altitude.

3 Maximum hovering take-off weight out of ground effect

- Determine maximum permissible collective pitch as specified in para. (2) above.
- Transfer the maximum permissible collective pitch figure to scale G and read opposite, on scale H, the approximate maximum permissible weight.

4 Approximate gross weight during hover

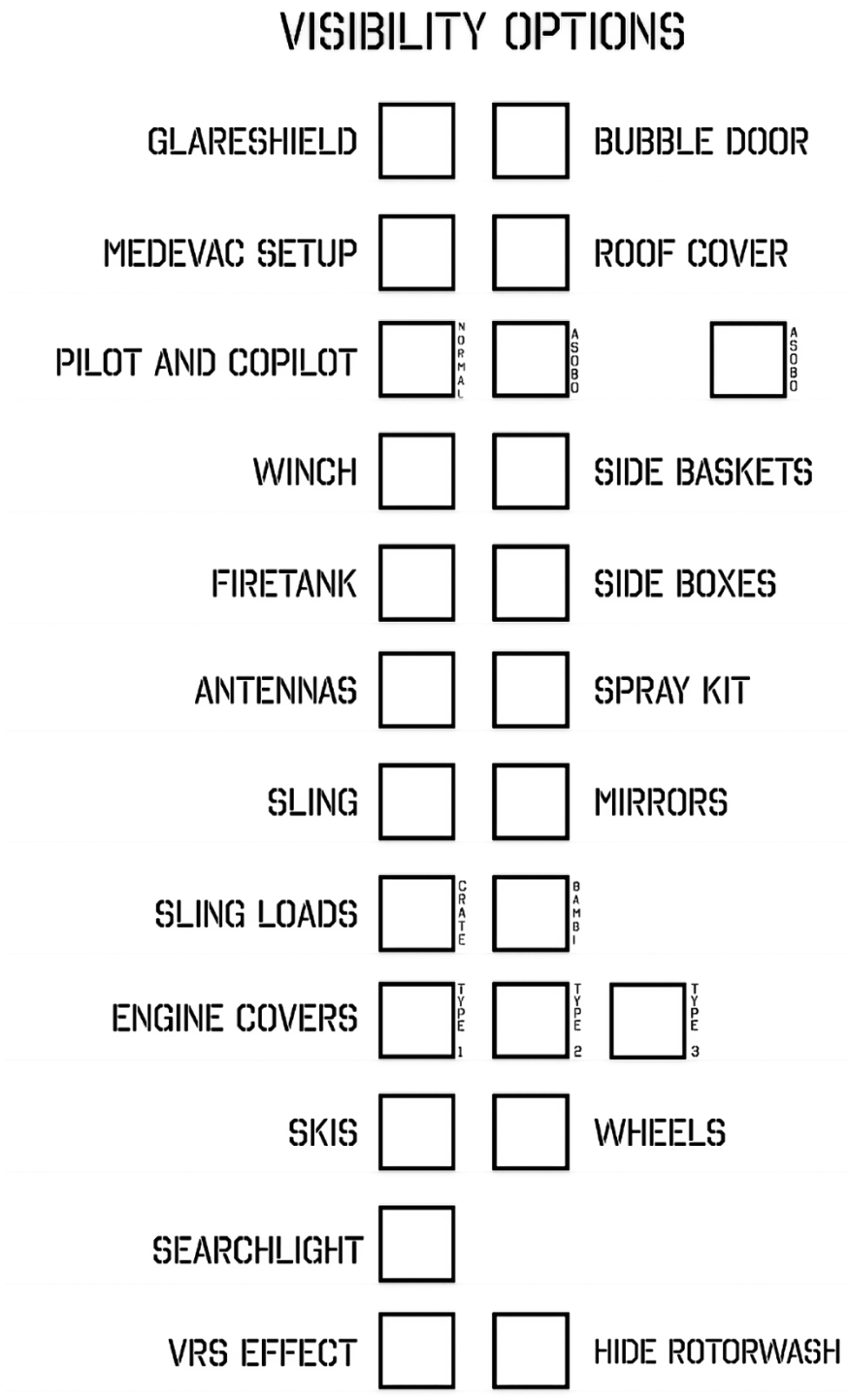
- Indicate your weight

7. User options

Clipboard list for attachments

The SA315B Lama addon for MSFS comes with a multitude of different attachment options.

In order to activate those options, the player will have to use the clipboard tablet present on left bottom of the center console. Be aware that some attachments are mutually exclusive and will disappear if another conflicting attachment is added.



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 20 ft radio alt)
- While lifting again you will feel the weight added

- Fly to your target
- Use binding to release the water
- Water effect happens
- Weight is reset

- Repeat the process

You can also release the sling cargo (crate), either to unhook or in case of an emergency, with the same key binding as the water release (TOGGLE TAXI LIGHT)

Flight models

The user is given the option to choose between the “regular” flight model and a “beginner” flight model.

Regular flight model

This flight model is the default FM present on the aircraft, no modifications are necessary in order to use it.

Within the framework provided by MSFS, the team has tried to provide the user with “as-close to reality” experience. This version will provide a challenging yet rewarding flight model and the users most accustomed to helicopter flight-simming should be able to conquer the Lama without too much difficulty.

This FM has been worked on with actual Lama pilots and their feedback has been taken in account to craft this Flight Model. Unfortunately, some details are missing as it is currently difficult to fully replicate the behaviors of the Lama within the limitations of the CFD of MSFS.

Beginner flight model

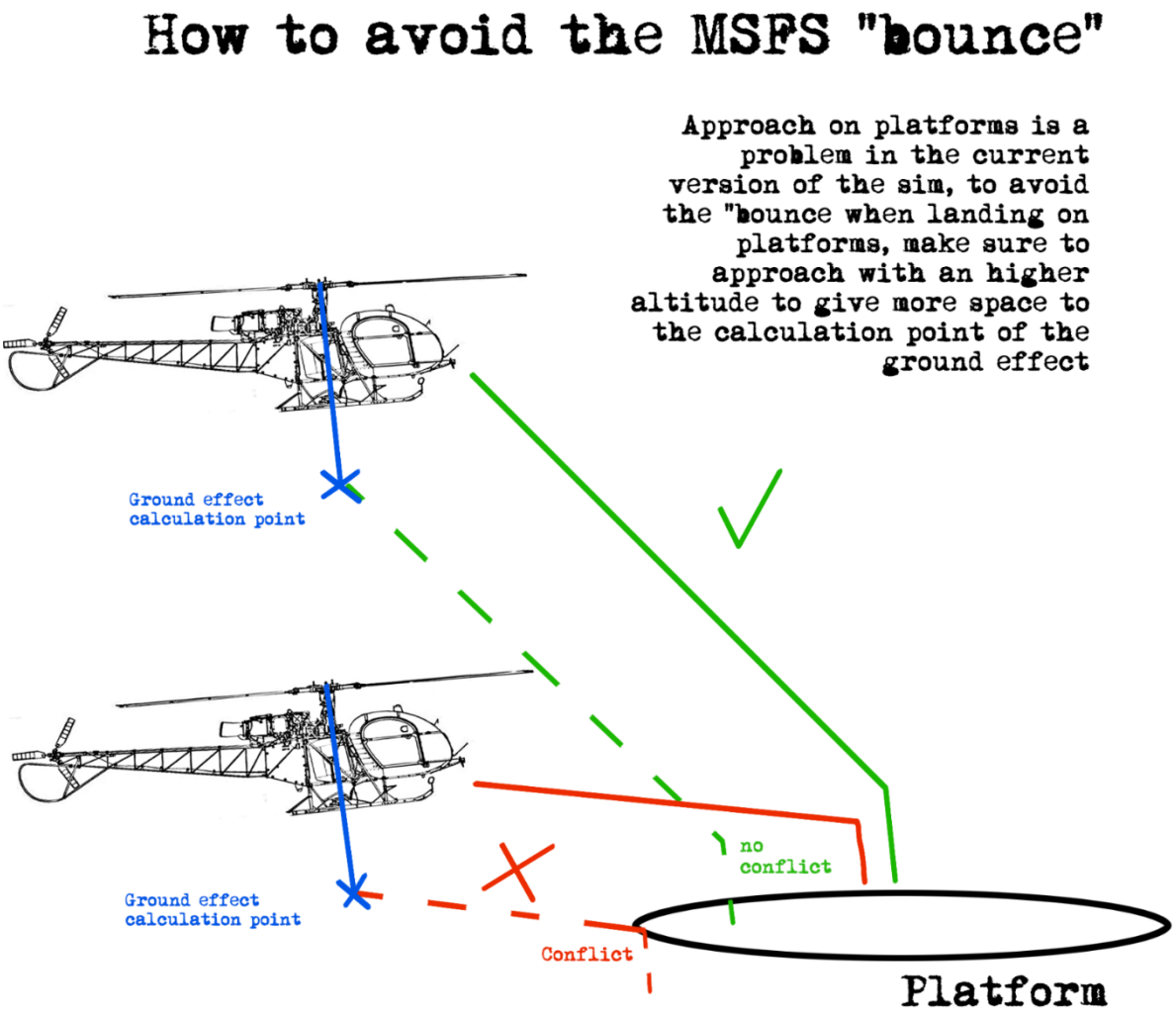
This flight model has been created with the hope that flight simmers who want to start using helicopters in MSFS can enjoy a less challenging version of the Lama without completely loosing its main characteristics. It also fits for people who have twist grip Joysticks.
This version is simply reducing the sensitivity of the inputs, allowing greater travel distance of the controls for smoother control of the aircraft.

Current known issues and tips

- No anti torque pedal is needed while lowering collective:
    - While lowering collective, the helicopter does not counter rotate to the left, this behavior is being worked on and will hopefully be added to the flight model in later updates.

- Crates and Bambi bucket shaking while in hover:
    - This is due to the calculations used to generate the shaking effect, a fix is being worked for later updates.

- Helicopter jumps when arriving over a platform:
    - The helicopter behavior when suddenly flying over a platform, transitioning from free air to sudden ground, will make the helicopter “jump” and turn on the yaw axis. This has to do with the CFD from MSFS calculating a single point below the helicopter for ground effect instead of the whole rotor disc.



Controls Sensibility

When flying with a HOTAS joystick or a twist grip joystick, I would recommend reducing sensibility if you are flying with the regular flight model. This will allow you to have more precise inputs.

Thanking

Dear Sérgio, Léo, Daniel, Michael, and HB-XDG,

I want to extend my heartfelt thanks to each one of you for your great contribution to the development of the Lama. Your expertise, dedication, and hard work have been crucial in bringing this project to life.

Together, you have not only helped create a product that transpire love for helicopters but have also been an inspiring group of people to work with. I am truly grateful for your support.

I also would like to thank all the members of my Discord server who got involved in the development and for the motivation they gave me to try to create a great product for MSFS.

Thank you all again,

Taog