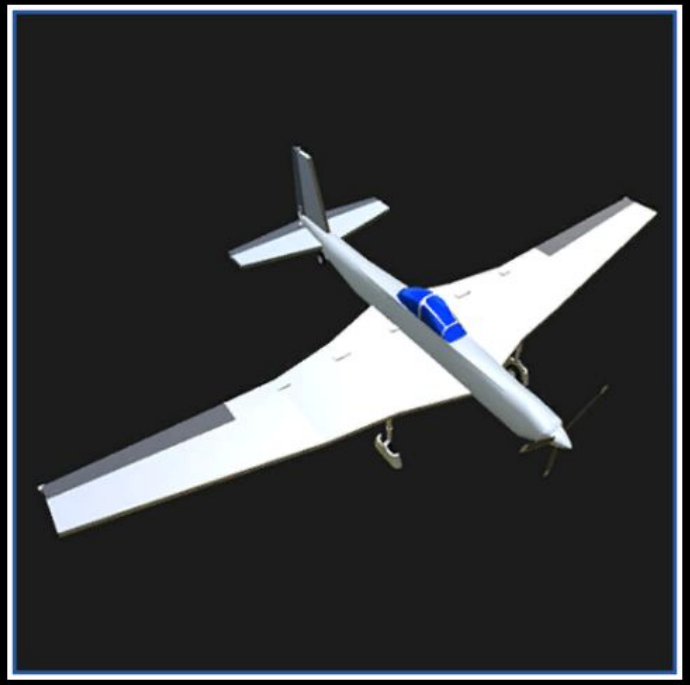
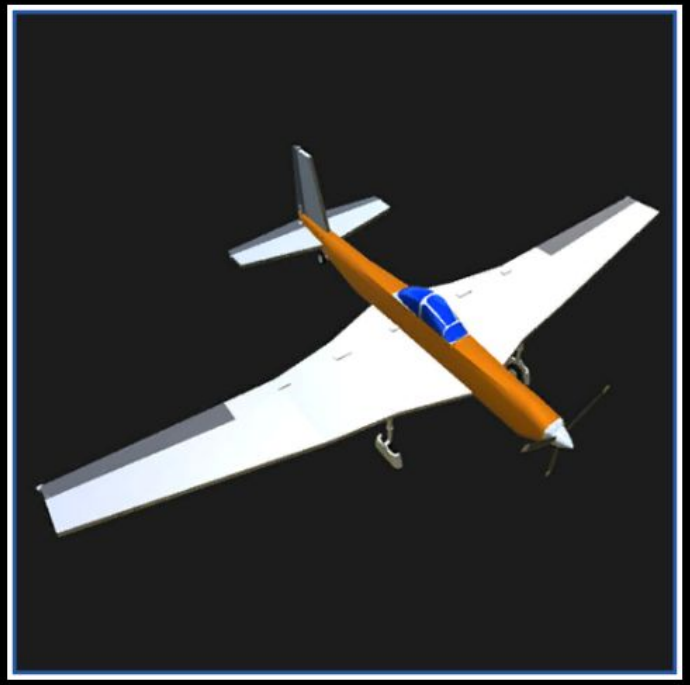


Here is a plane. Get comfortable, we are going to talk about this plane and how it works.



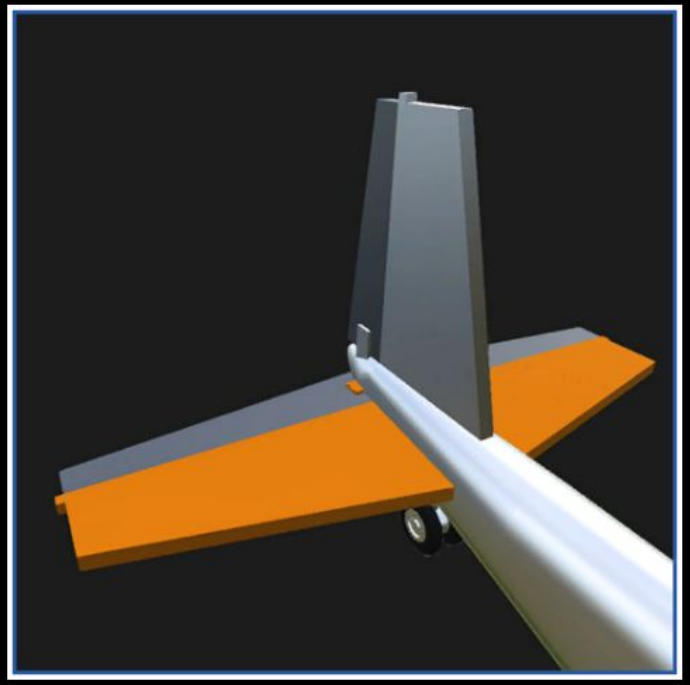
The body of the plane is called the fuselage. You can build the fuselage however you want using the block pieces found in the Structural section of the part list.

These are the primary wings. They are large and provide the lift that gets the plane off the ground.

Typically, they use a semi-symmetric airfoil, which means they produce lift even when flying perfectly level through the air.

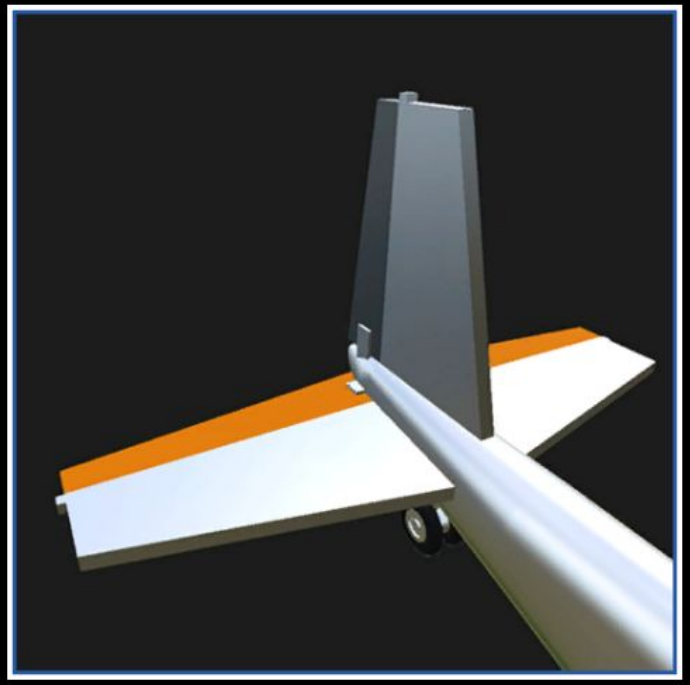
The primary wings have aileron control surfaces. These are controlled by moving the flight control stick left or right and cause the plane to roll.

When the pilot rolls the plane, one aileron tilts down, which causes it to produce more lift. The other aileron tilts up, which causes it to produce less lift. This imbalance in force causes the plane to roll.

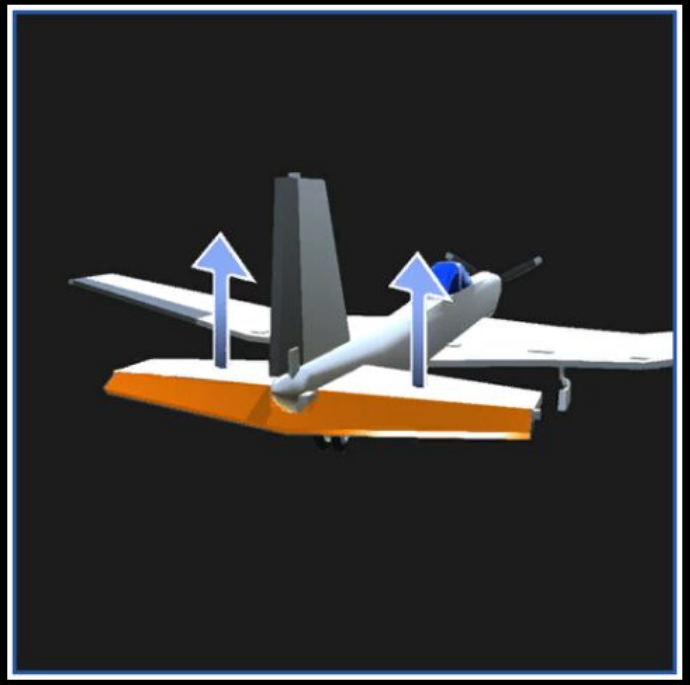


This is the tail section and these are the horizontal stabilizers. They help the plane stay level and prevent unwanted pitching.

Horizontal stabilizers often use a symmetric airfoil. This means that they do not produce lift when flying perfectly level through the air.

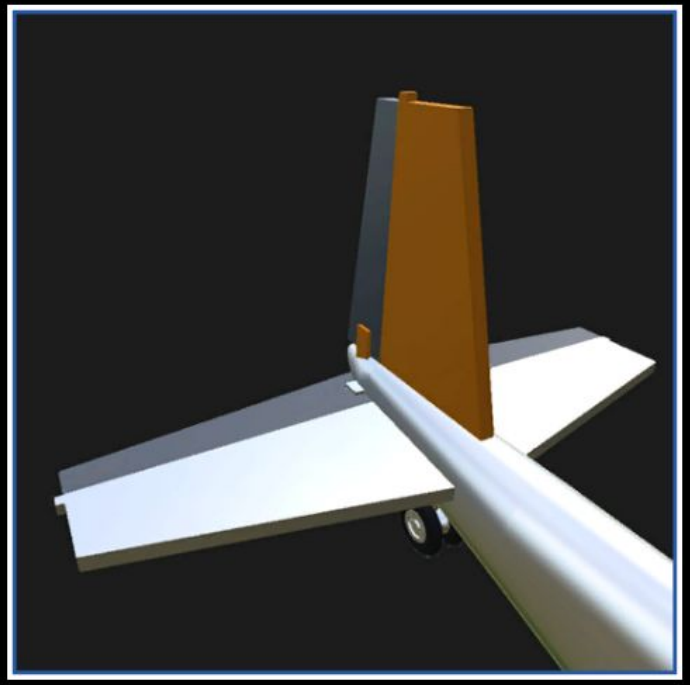


The horizontal stabilizers have elevator control surfaces. These are controlled by moving the flight control stick forward or backward and cause the nose of the plane to tilt upwards or downwards.



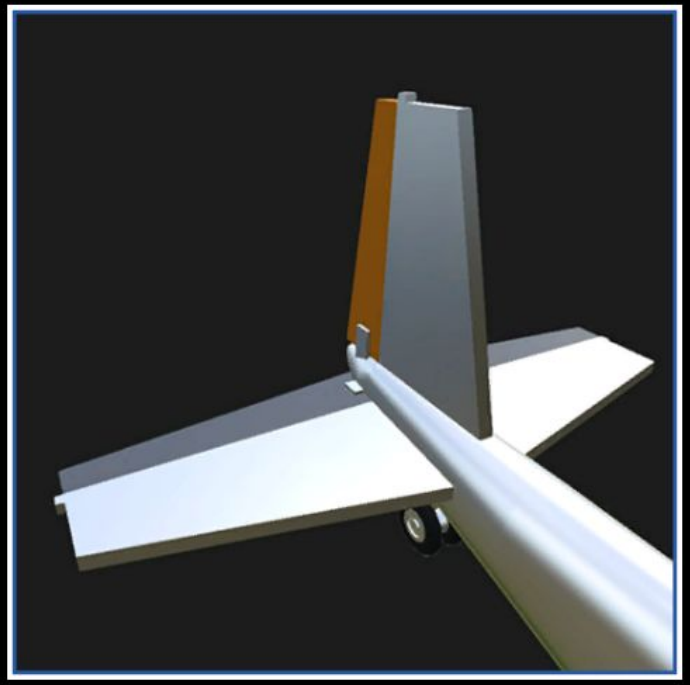
When the pilot pushes forward on the flight control stick, the elevators tilt down. This causes them to produce more lift and raises the tail section, which in turn causes the nose of the plane to pitch downwards.

Pulling back on the stick has the opposite effect and the nose pitches upwards.

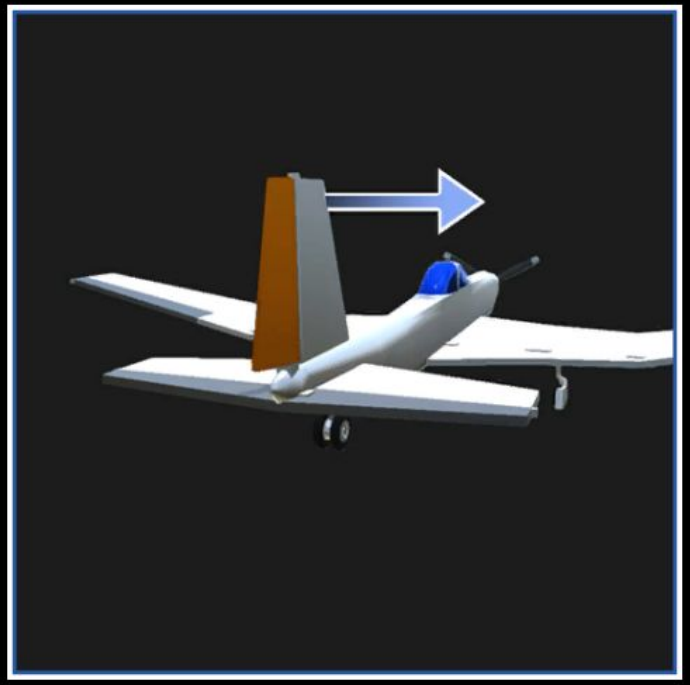


This is the vertical stabilizer. It helps to make sure the plane doesn't sway left or right uncontrollably. Without a vertical stabilizer, the plane could not fly straight.

The vertical stabilizer should always use a symmetric airfoil. Using a semi-symmetric airfoil here would be a very bad idea! Can you guess why?



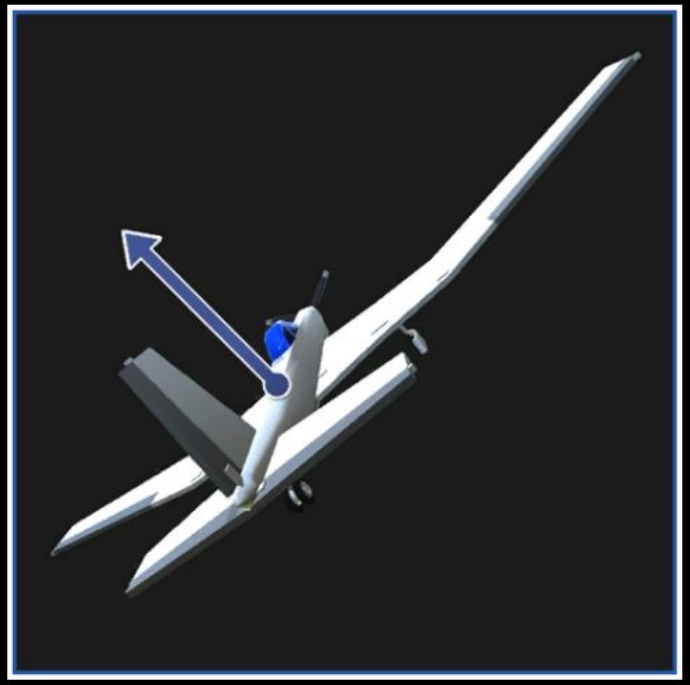
The vertical stabilizer has the rudder control surface. The rudder causes the plane to yaw left and right.



The rudder pushes the tail around, which causes the nose of the plane to turn in the opposite direction.

Pressing left yaw pushes the tail of the plane to the right and causes the nose to yaw to the left.

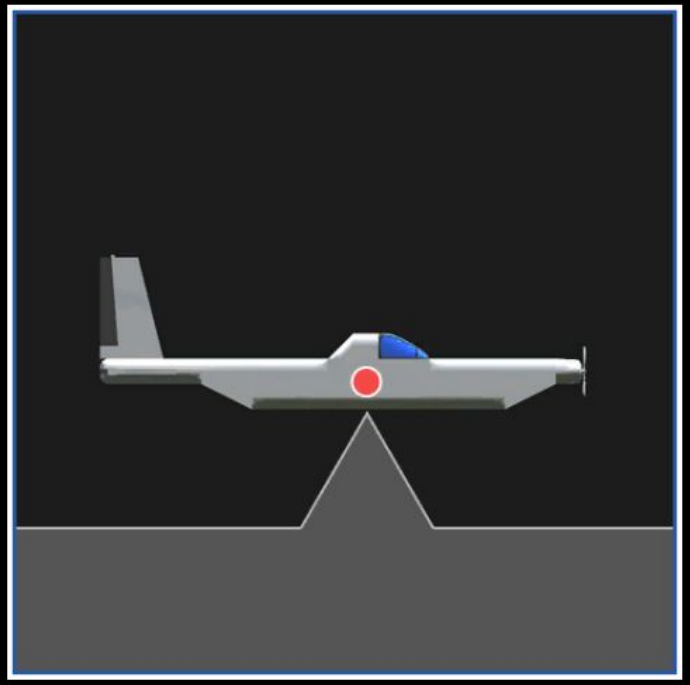
Pressing right yaw would cause the opposite effect.



You might be tempted to think that the rudder is the best way to turn the plane. Actually, the most effective way is to use the ailerons to bank the plane in the direction you want to turn, and then pull back on the elevator.

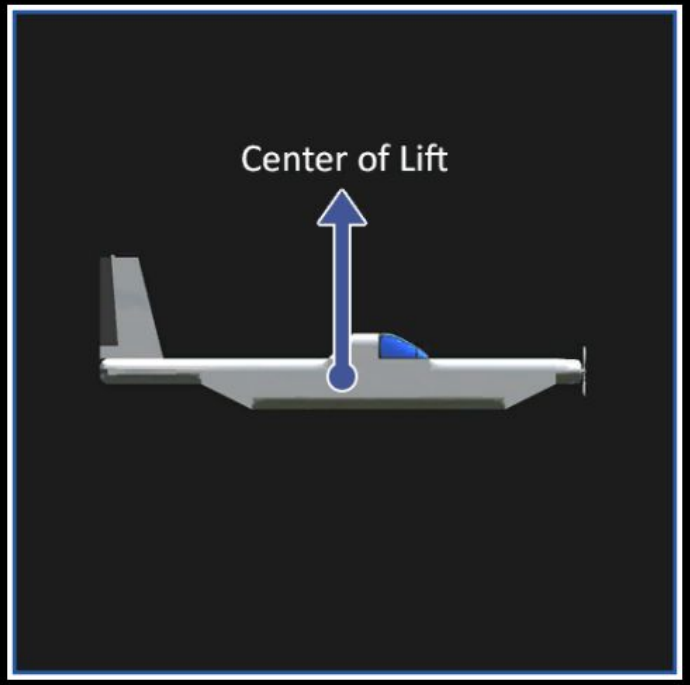
The rudder is used in more advanced maneuvers, and is mostly used to keep the nose steady and prevent unwanted turning.

If this is confusing, don't worry. In this game you can mostly ignore the rudder and just stick to the ailerons and elevators.

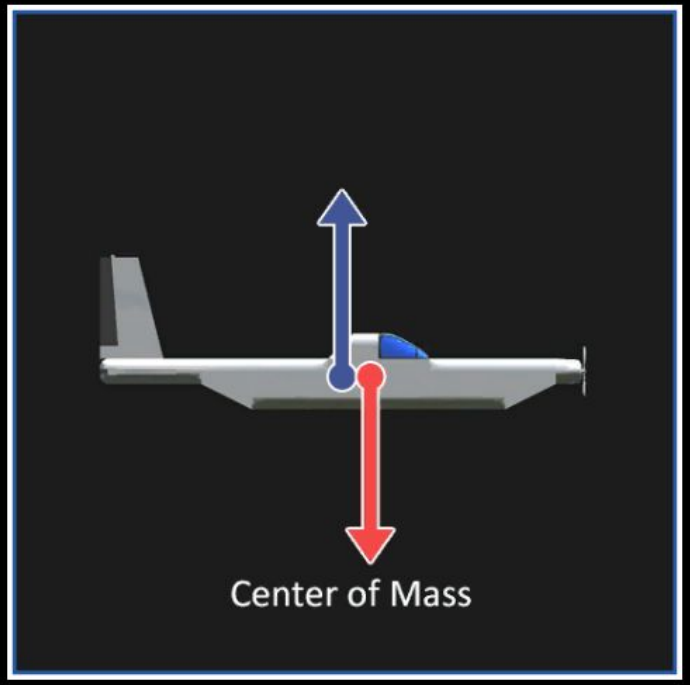


Every plane has a specific point where it could balance perfectly if it were gently placed on a fulcrum. It would not tip forward or backward. This point is called the center of mass, or CoM.

The CoM is typically a bit behind the front edge of the main wing. Moving the CoM forward will make the plane more stable. Moving it back will increase agility up to a point, but be careful because moving it too far back will make the plane unflyable!

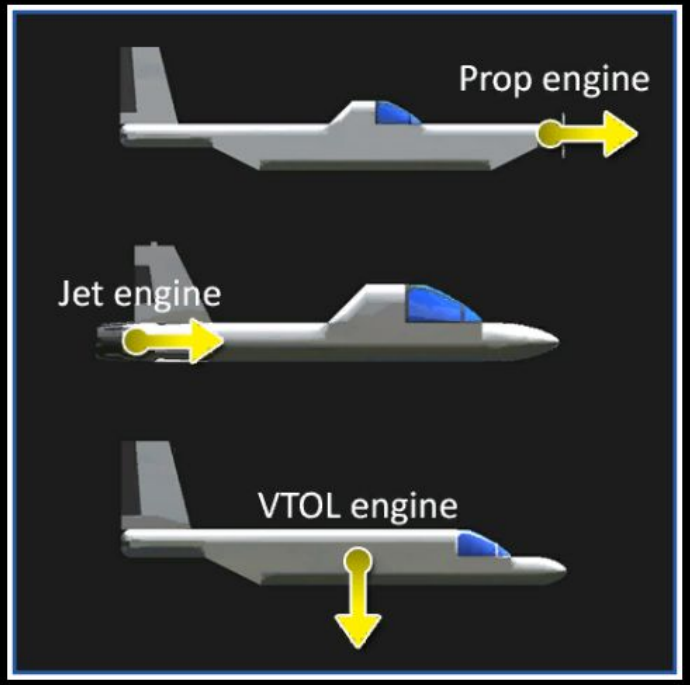


Another important point is the center of lift or CoL. When you consider the strength and location of all the wings in the plane, this is the central point of their combined forces.



The relationship between the CoM and the CoL is extremely important and affects how your plane will fly. They should be close together, but the CoM should almost always be a little in front of the CoL.

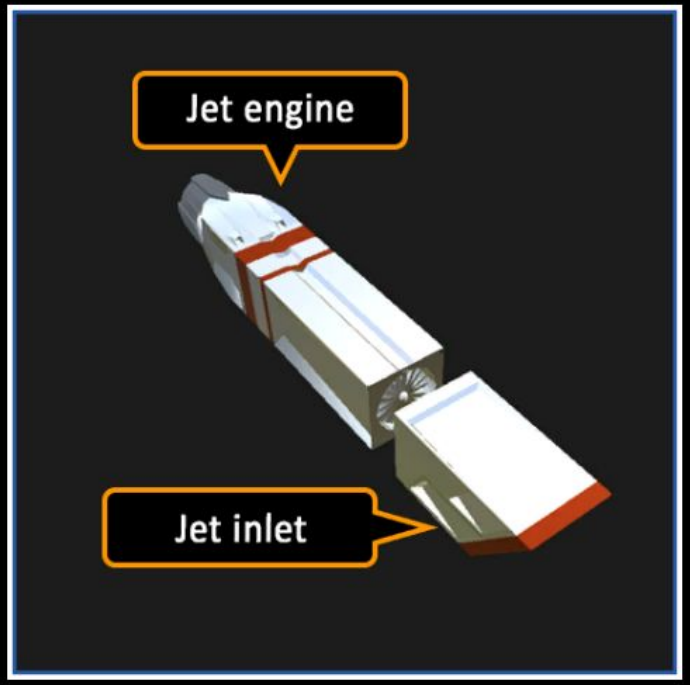
If your plane is handling poorly, you may need to move the CoM a little more forward of the CoL. You can do this by adding extra weight near the front (which moves the CoM forward), or moving the wings back (which moves the CoL back).



One more point of interest is the center of thrust or CoT. When you consider the strength and location of all engines in the plane, it is the central point of their combined thrust.

The CoT is much more forgiving and its placement doesn't need as much attention. Unless you are designing a vertical take-off and landing (VTOL) plane, like a Harrier. If you are making a VTOL plane, then you need to make sure that CoT is on the CoM like white on snow! If not, the plane will be extremely hard to control.

You can toggle the CoM, CoL, and CoT indicators on or off at anytime through the menu.



One last thing before you go. Jet engines are like humans in that they need air to breathe. If you have jet engines, it's a good idea to put an inlet on your plane to make sure the engines are getting enough air.

Inlets do not need to be directly connected to a jet engine. As long as you put an inlet on your plane, the air will be magically directed to any jet engines.

That is all I have. Thanks for reading and have fun building some planes!

Done