

Fire needs air to burn, so how does the rocket work in space?

Commercial airplanes and fighter planes burn fuel by using the oxygen available in the atmosphere, but what about those missiles flying into space? Invite you to find out!

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Commercial airplanes and fighter planes burn fuel by using the oxygen available in the atmosphere, but what about missiles flying into space? In fact, there is no air in aerospace, so how can rockets ignite essential engines and fuels needed in space?

Short answer : Only two components are needed for the combustion reaction, which is **fuel** and **oxidation** . Most cosmic rockets carry their fuel and oxidants into space, so they don't need to rely on the oxygen available in that space. Furthermore, it is not necessary to fire to provide rocket propulsion; You can gain thrust by simply pushing " *mass* " out of the rocket.



Rocket in space. Image source: 3dsculptor / Fotolia)

How can rockets work in space?

Almost in space there is no air, so how can rockets work there? Because they have no air to repel, so how to accelerate or change the direction?

Certainly one of us has also learned about **Newton's Law of Motion** in high school. All forms of movement in this world are thought to be dominated by three major laws of Newton's motion, missiles are no exception.

Observe the most basic form of motion - **walking** . To be able to walk, we have to set our feet firmly on the ground and then push back to the ground, then move forward.



When walking on the ground, the repulsive force helps us step forward. That's the basic thing we can do when walking. Image source: Pixabay

Of course, this seems silly to think that we, with weak legs, can "push" the ground, but that's exactly what happens. Because the Earth's mass is significantly larger than the body weight, the ground does not really push back. The type of action reaction is governed by **Newton's Law III**, which states that "*for every action, there is always a reaction of the same magnitude and vice versa*".

You can follow the law of motion III in countless cases. Suppose there are two small boats in the middle of the lake. If a person jumps from one boat to another, the first boat will be pushed backwards as soon as the person jumps.



It is this law that helps rockets move and transform in space. Rocket engine is a jet engine. To move forward, a rocket launches high-pressure gas (*produced by the combustion reaction*) from its tail. Therefore, the action (*air spray*) activates the reaction (*ie the missile moves forward*).

However, as mentioned above, gas emitted from combustion and combustion reactions, a traditional combustion reaction, requires oxygen to burn. After all, we all know that there is no air in the air.

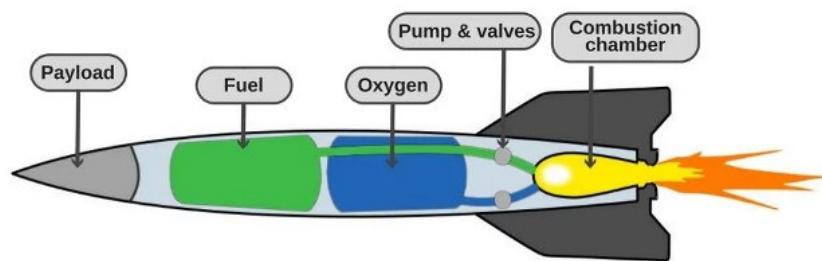
So . what is the alternative here?

How can rockets work in space without oxygen?

Fire cannot burn without two important elements: **fuel** (*flammable*) and **oxidizing agent** (*start the combustion process and maintain it*). So you need fire to propel the rocket, but there is not enough air (*oxidizing agent*) in space. So what can be done?

In fact, this is really simple: if you go to the drawing competition, but that place doesn't give you the color paints, what will you do? Do you bring your own paint? Very simple!

That's exactly what most space spacecraft do. Many rockets carry a liquid oxygen tank, which acts as the oxidant needed to maintain the combustion reaction. The most commonly used fuels in rockets are liquid hydrogen or kerosene.



Fuel and oxidants combine inside the rocket to start the burning reaction.

In fact, thousands of oxidation-fuel combinations have been used in aerospace missiles over the years, but liquid hydrogen and liquid oxygen are still one of the most effective mixes.

Solid rocket fuel

Note that you do not necessarily need to use oxygen as an oxidizer. Almost all solid-fuel rocket engines use aluminum powder as fuel and ammonium perchlorate, composite propellant *fuel* (*solid rocket propellant used in manned and unmanned rocket vehicles.*) as an oxidizer.



A rocket was launched using solid fuel. Photo source: Steve Jurvetson / Wikimedia Commons

Hyperbolic push explosives

As mentioned above, you don't need oxygen to create fire inside a rocket, because there are certain chemicals - when exposed to each other - naturally burn. **Propellants** that use these chemicals are called **hyperbolic propellants** .

The most common hyperbolic fuels include hydrazine, monomethylhydrazine and unsymmetrical dimethylhydrazine, often used together with nitrogen tetrachloride (*oxidizing agent*) to activate self-igniting, meaning you do not need oxygen to produce fire.



The supply of fuel (*containing hydrazine as fuel*) is loaded into the space ship MESSENGER. Photo source: NASA / Wikimedia Commons

Monopropellant (Single component fuel)



These propellants include chemicals that release energy and release mass after chemical decomposition. This fuel often contains substances such as hydrazine or concentrated hydrogen peroxide exposed to iridium catalysts. **Monopropellant** - one-component fuel commonly used in reactive controllers, provides height adjustment.

All of the above mentioned is to say that, while oxygen is definitely an essential oxidant on Earth to create fire, on the contrary, you don't necessarily need to use oxygen to propel the missiles in space. By having a few other alternatives!

Having fun!

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